



UNIVERSITY OF CENTRAL ASIA
GRADUATE SCHOOL OF DEVELOPMENT
Mountain Societies Research Institute

Mountain Societies Research Institute Annual Report 2019



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Annual Report 2019

MSRI Mission

MSRI is committed to advancing the *Sustainable Mountain Development* agenda in and around mountain societies of Central Asia. This mission is accomplished through transformative research, education, and dissemination of key findings for development practitioners, policy makers, local communities and scientific scholars working together with partner agencies. Our goal is to improve local livelihoods and promote sustainable environmental development in the region. MSRI is part of University of Central Asia's (UCA's) Graduate School of Development.

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Photo credits

On the cover (front): Glacial valley in the Gunt River basin within Badakhshan National Park, GBAO, Tajikistan. Photo by Roy Sidle

On the cover (back): High Pamirs, GBAO, Tajikistan. Photo by Roy Sidle

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Director's Message

A year of change, diversification, and increased productivity aptly describe how the Mountain Societies Research Institute (MSRI) responded to the challenges of 2019. In my first full year as Director, the MSRI headquarters moved to Khorog, Tajikistan, with an office remaining in Bishkek, Kyrgyzstan. This move was partially predicated on connecting MSRI's mission with the Earth and Environmental Sciences major on the Khorog campus of University of Central Asia (UCA). Along with this move, we have seen an increase in grant applications related to natural hazards, sustainable water resources, and land degradation to better align our research with some of the key environmental and societal issues in the mountainous regions of Central Asia. These new research forays, coupled with MSRI's traditional focus on food security, migration, social dynamics, ecosystem processes, and natural resources management, offer us more leverage in external partnerships and funding sources, as well as excellent opportunities for transdisciplinary research.



In 2019, MSRI strengthened ongoing partnerships and research programs, initiated new projects, taught courses in the Earth and Environmental Sciences major at UCA, conducted a graduate level Certificate Programme on Natural Resources Management, and hosted Summer Universities and workshops. A major new project, supported by European Union's Horizon 2020 research and innovation programme entitled "Towards forward-looking migration governance: addressing the challenges, assessing capacities and designing future strategies" (AGRUMIG), focuses on complex migration issues in the Batken, Jalal-Abad and Naryn provinces of Kyrgyzstan. Negotiations progressed to partner on two World Bank funded projects related sediment sources and delivery in the Nurek dam catchment in the Pamir-Alay range of Tajikistan; these projects will initiate in 2020. Work also commenced on the project "Addressing the climate change in Afghanistan through sustainable energy and ecosystem management" funded by the European Commission in which MSRI is collaborating with AKF-Afghanistan and the Wildlife Conservation Society. MSRI researchers contributed to the development of a successful NASA proposal "Atmospheric teleconnections and anthropogenic telecouplings drive land change in Central Asian highlands: How environmental changes, migration, and remittances threaten montane agropastoralist livelihoods and community viability." A new project, "Thrive Tajikistan: Enhancing Social Services, Governance, and Economic Inclusion in Border Regions", jointly funded by USAID and Aga Khan Foundation was launched in 2019; MSRI is focusing on food security and agricultural systems in GBAO and Khatlon regions.

Publication output increased in 2019, with MSRI staff publishing 24 papers and reports, including 16 in refereed journals and two MSRI Research Briefs. To meet the challenges of the coming years, MSRI is poised to diversify its research portfolio, continue to increase research productivity, and partner with diverse regional and international organizations. Our research and outreach networks have expanded outside the greater Central Asia region and include Germany, Switzerland, Austria, UK, Japan, USA, Canada, and Italy. These international partnerships and collaborations with our colleagues within AKDN will enhance our current focus on 'research for development' in Central Asia.

Please visit our website to follow the progress of MSRI: www.ucentralasia.org/research/msri/en

Roy C. Sidle
Director of MSRI

Professor of Earth and Environmental Sciences
University of Central Asia



Photo: Roy Sidle

Mountain Societies Research Institute

The Mountain Societies Research Institute (MSRI) is an inter- and transdisciplinary research institute within UCA's Graduate School of Development dedicated to addressing the challenges and opportunities within Central Asian mountain communities and environments. MSRI's goal is to support and enhance the resilience and quality of life of mountain societies through the generation and application of sound scientific research.

The objectives of MSRI are:

- 1) to generate new knowledge on mountain environments and societies based on applied research;
- 2) to enhance Central Asian capacity to conduct research relevant to mountain societies and environments;
- 3) to serve as a knowledge hub for scholars, development practitioners, decision-makers, and mountain stakeholders who are focused on our goals;
- 4) to inform policy and practice through research, training sessions, and certificate programs; and
- 5) to contribute to the development and implementation of the University of Central Asia's (UCA) academic program in Earth and Environmental Sciences in the School of Arts and Sciences.

MSRI's 'research for development' agenda in Central Asia disseminates strategic information contributing to improvement of local livelihoods and sustainable environmental development. These remote mountain villages need access to better climate, weather, and streamflow data, which affect agricultural production, natural hazards and related disasters, domestic water supplies, and livelihoods. With its new main office on the UCA Campus in Khorog, Tajikistan, and an ongoing office in Bishkek, Kyrgyzstan, MSRI is well placed to tackle mountain research opportunities and outreach challenges within much of Central Asia, northern Afghanistan, and surrounding mountain regions, reaching many of these poor and vulnerable communities. MSRI organizes and contributes to various short courses, summer universities, and post-graduate certificate programmes dealing with topics such as natural resources management, mountain livelihoods, and disaster risk reduction.

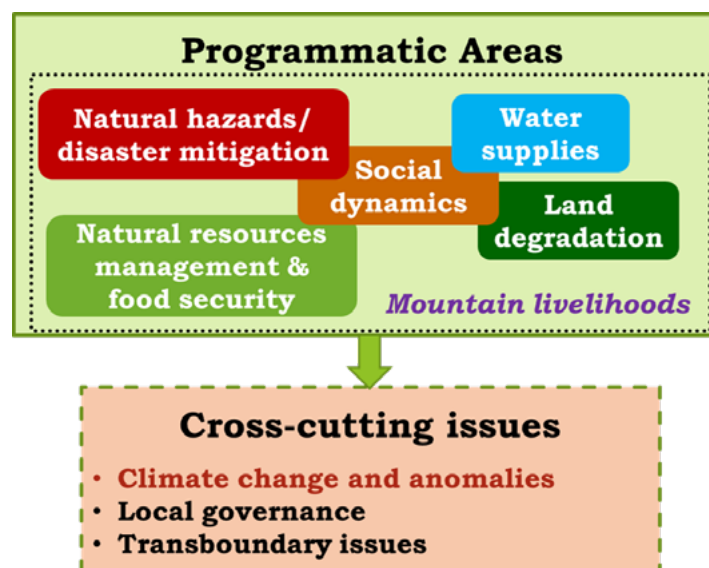


Photo: Ben Jarihani

To accomplish our goals, we partner with a wide array of ADKN organizations, international and regional universities and research centers, donors, and NGO's.

MSRI's research primarily focuses in the following areas:

- Natural resources management and food security
- Regional and local water supply issues
- Natural hazards and associated disaster mitigation
- Land degradation related to past and current land use
- Social dynamics



In addition to these focal areas, issues that cross-cut many of these themes include climate change; local governance; transboundary issues, and stakeholder priorities and concerns. MSRI is expanding its research activities in Tajikistan and northern Afghanistan by strengthening ongoing partnerships and research programmes, initiating new projects, conducting various training activities.



Photo: Reiko Kodama

MSRI Projects in 2019

Pathways to Innovation: Strengthening Mathematics, Science, and Economic Policy Capacity in Afghanistan and Central Asia

The three-year 'Pathways to Innovation: Strengthening Mathematics, Science, and Economic Policy Capacity in Afghanistan and Central Asia', funded by the International Development Research Centre (IDRC), Canada, and the Aga Khan Foundation Canada, is a multi-faceted project with components focusing on innovative and applied research and training to strengthen individual and organizational skills in mathematics, environmental science, and economic policy capacities in Afghanistan, Tajikistan, and Kyrgyzstan. This focus aligns with the project's overarching objective of contributing to human and organizational capacity for innovation in Central Asia and Afghanistan.

Post-graduate Certificate Programme in Natural Resources Management

MSRI, as part of on-going Pathways to Innovation project, offered a post-graduate Certificate Programme in Natural Resources Management from 15 July to 4 August 2019. This three-week intensive, 30 ECTS (European Credit Transfer and Accumulation System) programme enrolled 21 participants including faculty members and researchers of Badakhshan University, Bamyan University, Khorog State University and the Aga Khan Foundation (AKF) in Afghanistan. The course was designed to deepen university faculty understanding of natural resources management issues in mountain regions that will enhance their research and teaching capabilities. The training components and delivery of the programme were built on MSRI's research focal areas. Five integrated topics were selected that best describe the most pressing natural resource issues in Afghanistan and Tajikistan, including: concepts of sustainability and sustainable land management; integrated agricultural management and food systems; livelihoods in rural mountain communities; natural hazards and disaster risk reduction; and climate change.

As part of the Certificate Programme and our commitment to the partner universities, MSRI facilitated knowledge dissemination and transfer of technical skills to faculty members in Afghanistan and Tajikistan as well as to their students. All three participating universities conducted 4-5 days of training workshops on Natural Resources Management for the faculty members and students in their respective universities in November and



Photo: Alma Uzbekova

Out of 20 selected participants from Afghanistan for the Post-graduate Certificate Programme in Natural Resources Management – 7 were women

December of 2019. In total, 121 faculty members and students attended the workshops conducted at three partnering universities, Badakhshan University and Bamyan University in Afghanistan and Khorog State University in Khorog Tajikistan. On average, 43% of the student and faculty participants were female. Workshops drew high interest for future joint research and capacity building activities for faculty members as well as for the 4th year students, particularly from Afghan Universities.

Applied research projects

Additionally, during 2019, MSRI supported 11 on-going applied research projects, including 5 research projects with Bamyan University, 3 research projects with Badakhshan University, and 3 projects with Khorog State University. The research projects address diverse thematic areas including food security, water resources, environmental conservation, and tourism for income generation in Afghanistan and Tajikistan. All research projects will be concluded by mid-2020 and research findings will be shared with wider stakeholders through workshops and conferences both in Afghanistan and Tajikistan.



More information: <https://www.idrc.ca>



Photo: Asel Murzakulova

AGRUMIG ‘Leaving Something Behind’ - Migration Governance and Agricultural & Rural Change in ‘Home’ Communities: Comparative Experience from Europe, Asia and Africa

Migration is driven increasingly by rural decline and stress in the agricultural sector due to the pressures of climate change, weak terms of trade, and intensifying inequalities and aspirational changes. Migration itself can create new challenges for the agricultural and rural sector, through aggravating the labour burden for those who stay behind (often women), intensifying inequalities, while contributing to a loss of agro-ecological knowledge and productive labour. In contrast, migration has, in some contexts, been shown to be a stimulus for agrarian and rural growth through the inflow of cash and skills to the rural sector, and through generating opportunities to transform gender roles.

The AGRUMIG project titled ‘Leaving something behind’ - Migration governance and agricultural & rural change in ‘home’ communities: comparative experience from Europe, Asia and Africa has received funding from the European Union’s Horizon 2020 research and innovation programme. The AGRUMIG project focuses on the linkages between out-migration and agricultural and rural change in seven countries (Nepal, Thailand, Morocco, China, Ethiopia, Moldova and Kyrgyzstan). The project identifies the mechanisms that produce the bewildering diversity of outcomes associated with out-migration and rural change. Qualitative Comparative Analysis (QCA) is employed; a method that provides benefits to both academic and scientific scholars and policy decision makers. It enables scholars to generate modest generalizations from cases in a way that reflects the diversity and complexity of the social world. It also allows policy makers to design contextual specific policies, thereby potentially enhancing the success of such policies. QCA is a promising method to systematically compare the multiple combinations of causes that produce these diverse outcomes and identify patterns and types of situations and dynamics. Based on this comparative analysis, the AGRUMIG project aims to contribute to the framing of context specific policy at national and global levels that more effectively combines migration and agriculture and rural change.



More information: <http://agrumig.iwmi.org/>



Photo: Aziz Ali Khan

Thrive Tajikistan: Enhancing Social Services, Governance, and Economic Inclusion in Border Regions

In 2019, MSRI became involved in a new project, *Thrive Tajikistan: Enhancing Social Services, Governance, and Economic Inclusion in Border Regions*, jointly funded by USAID and Aga Khan Foundation. In consultation with Thrive Global Development Alliance (GDA) members, Feed the Future (FtF) partners, Mountain Societies Development Support Programme (MSDSP), and other governmental universities and research institutions, several research topics and concept notes related to food security and food systems were identified. Potential research sites in Gorno-Badakhshan Autonomous Region (GBAO) and Khatlon Region of Tajikistan have been identified.

Over the life of the project, MSRI plans to conduct three research projects related to food security and food systems within selected broad environmental contexts: two projects in GBAO and one in Khatlon region. In addition, promoting further cooperation and development of joint research on food security, multiple meetings with partners as well as other national and international agencies in GBAO and Khatlon regions were arranged.

Within the scope of Thrive project, one research project was launched in 2019 in collaboration with Pamir Biological Institute (PBI) on “Promotion of high yielding wheat crops through varietal screening to improve food security in the Gorno-Badakhshan Autonomous Oblast (GBAO), Pamir Region of Tajikistan”. The concept was developed in cooperation with the Chengdu Institute of Biology (CIB) in Sichuan Province, China, and the Pakistan Agriculture Research Council (PARC), both which focus on development of agricultural products in high-altitude areas and have experience working in similar climates. The goal of this research is to improve food security through scientific research and screen out of the best performing varieties – i.e., high yielding, disease resistant, acclimatized to GBAO ecological conditions – for further proliferation and dissemination among mountain farmers in this region. Thus, the two primary research objectives of this project are:

- Testing different spring and winter wheat varieties under GBAO specific ecological and climatic conditions.
- Screening the best performing and most promising disease resistant spring and winter wheat varieties for further proliferation and dissemination among key stakeholders, including local farmers and agriculture extension departments of government, as well as development NGOs in GBAO region.



Photo: Lira Sagynbekova

Palaeoclimate, Environmental Change and Social Interaction in Central Asia

The Mountain Societies Research Institute in collaboration with the German Research Centre for Geosciences (GFZ) organized the second summer school 'Learning Landscapes through Environmental Research and Monitoring' as a part of the *Paleoclimate, Environmental Change and Social Interaction in Central Asia (PALESCA)* project, funded by the German Federal Ministry for Education and Research (BMBF). The summer school was held from 3-11 July 2019 in Naryn, Kyrgyzstan and offered an intensive and interesting program for students and young researchers who study earth and environmental sciences. Lecturers and experts of MSRI, German Research Centre for Geosciences (GFZ), Central-Asian Institute for Applied Geosciences (CAIAG), University of Amsterdam, Kyrgyz-Russian Slavic University (KRSU), Naryn State University, Camp Alatau and KyrgyzHydromet provided lectures and field trips on geology and natural disasters in mountain regions, soils, climate and phenology, dendrochronology, lake sediments, pasture management, wildlife studies, use of citizen science, and other related topics.

PALESCA field activities and trainings

Laboratory and field surveys were conducted at the University of Central Asia, Naryn State University, KyrgyzHydromet stations in Naryn, Salkyn Tor National Park, and other areas proximate to Naryn and At-Bashy districts. Participants also visited iconic sites along the Silk Road. Certificates, as well as special prizes from MSRI and GFZ, were awarded to participants, of which two were selected to take part in a 2-week training at GFZ in Germany. Within the framework of PALESCA, MSRI conducted two field training sessions on soils in Naryn and At-Bashy districts: (1) supporting local farmers in addressing the increasing problem of soil fertility loss in the region; and (2) training teachers and students in pilot schools to use soil and ecological information in the context of citizen science at remote secondary schools.

In addition, within the framework of the PALESCA project, MSRI experts conducted two types of field trainings on soils in Naryn and At-Bashy districts. The first training aimed to support local farmers in addressing the increasing problem of soil fertility loss in the region. Farmers gained knowledge about the tools to save soil from soil erosion, including the inclusion of perennial grass into crop rotations, and they learned how to take soil samples and conduct basic agrochemical analysis. Experts shared low-cost methods of conserving soil fertility, crucial for the economy of small-scale farms in Naryn. A second training was organized for teachers and

Soil manuals were distributed to eight schools of Naryn city, six schools of Naryn rayon, one school of the At-Bashy rayon and to three regional Departments of Education.

students in pilot schools to increase knowledge and access to ecological information by using a citizen science approach at remote secondary schools. Different soil experiments were tested and soil profiles were prepared at schools for teaching purposes.

Soil study and Evaluation Manual

A Soil Manual entitled “Soil study and evaluation through experiments” was developed and launched on 17 December 2019 in Naryn. A portable field laboratory and soil test kits were provided by GFZ to train farmers, teachers and students. The soil manual was approved by the Ministry of Education and Science of the Kyrgyz Republic and published in Kyrgyz and Russian languages. The manual will increase the knowledge of students and was preliminarily tested with teachers and students of pilot schools in the Naryn region who were involved in the PALESCA project as citizen scientists during the last two years. Manuals were distributed to schools, libraries, regional departments of education and universities in Naryn province, secondary schools in Jalal-Abad province, universities and libraries in Bishkek, and to UCA’s Education Improvement Program (EIP), which has pilot schools throughout the Kyrgyz Republic.



Manual available at: <https://www.ucentralasia.org/Research/Item/2488/EN>

Photos from Second PALESCA summer school: <https://flic.kr/s/aHsmENLkAS>

Photos from Soil manual presentation: <https://flic.kr/s/aHsmK6v6CY>



Photo: Maksim Kulikov

Improving Stability through Better Natural Resources Management

Historically the population of three border countries in Fergana Valley was closely interlinked, both socially and economically. During the past ten years this stable linkage has been seriously hampered by political decisions related to the processes of delimitation and demarcation of borders, economic protectionism, and the breakdown of infrastructure that formerly connected countries of the region. Supported by the Conflict, Stability and Security Fund (CSSF) in the UK, this four-year project focused on modelling natural resource management in trans-border areas and understanding the impact of changing climate on local natural resources. To understand people's perception of climate change, MSRI conducted series of field trips to cross border villages situated in the Isfara River catchment in Kyrgyzstan and Tajikistan borderlands. Researchers conducted semi-structural interviews with locals of different backgrounds to fully represent all opinions. In total, 152 people were interviewed from Ak-Sai, Ak-Tatyr, Kok-Tash, Paska-Aryk, Samarkandek, Uch-Dobo villages, and Batken town. To understand impacts of climate change on natural resources, researchers analyzed time series of remotely sensed vegetation indices and climatic factors, as well as flow in the Isfara River, which is the main source of irrigation water in the area.

Subsequent activities included field monitoring of vegetation and determination of plant species; both required to validate data obtained by remote sensing. Data were obtained on the state of the vegetation cover, as well as spatial data on the location of pastures, crop lands, and gardens. These data were used for modelling and validation of vegetation change in the Isfara River basin. Also, consultations were held with local stakeholders, representatives of village districts, and shepherds. The research revealed that the main factor controlling vegetation is the Isfara River runoff; the downstream croplands and pastures are overused and degrading, whereas the upstream pastures are underutilized. Climatic data analysis and opinions of local people agree that the mean annual precipitation is decreasing and mean annual temperatures are increasing. However, local people think that flow of the Isfara River is decreasing, whereas the measurements show it is increasing. The results of this research were presented several times to locals in the Isfara River Small Basin Council meeting and at the Day of the Isfara River. Research informed all interested parties and project partners - MSDSP Tajikistan and Kyrgyzstan, AKF, Ala-Too CAMP and Roza Otunbaeva Foundation.



Research findings available at: <https://www.ucentralasia.org/Research/Item/2571/EN>



Photos: Muslim Bandishoev

Balancing and Optimization of Multifunctional Use of Juniper Forests in Central Asia (JuniperCA)

The Pamir-Alai mountain system is a worldwide hotspot of biodiversity where forest ecosystems play significant roles, particularly Juniper forests. Use of firewood and degradation by pastoral practices prevent successful reforestation and jeopardize their survival, aggravated via drought stress caused by climate change. To protect these forests, a more comprehensive study of their ecology and growth conditions are necessary to develop integrated strategies which combine protection and sustainable use of Juniper forests.

This project uses a simulation approach to demonstrate the consequences of alternate behavior and strategies and relies on the efficiency of transdisciplinary and transboundary knowledge transfer. The main occurrence of Juniper forests in Central Asia is in the area near the border of Kyrgyzstan and Tajikistan.

Satellite data are used to derive the distribution and stock density of Juniper forest ecosystems. Geospatial data are used to assess the vitality of identified stocks. Furthermore, field samples were used to add remote sensing data to a regression model used to estimate the biomass of the identified stocks. The spread and the state of juniper forests in the project areas is modelled using satellite data. This component includes the development of correlations between wood biomass and satellite-based multispectral data. The selection and acquisition of satellite data, as well as the necessary preprocessing steps, were conducted.

To better understand the social-ecological system (SES) of the study area, the system was first characterized by literature research and a preliminary aggregation of available data near the study area. This information was then supplemented with the findings of a participatory, on-site observation and recorded in a detailed situation analysis. The situation analysis was then extended and completed through household interviews and focus group discussions, including the participation of all actors. Socio-ecological processes, like quantifying juniper harvests, wood utilization, livestock and hay farming, as well as types of grazing and their socio-cultural anchoring were examined and recorded. Emphasis was placed on the consideration of spatial location. The description of the SES also includes interactions with components of the mountain forest ecosystem. In the interviews, cattle as a trigger for soil erosion and degradation caused by trampling, as well as creating barriers for regeneration caused by browsing, are discussed. Interviews were recorded during the field work and compared with the findings from the literature.



More information: <https://www.akdn.org/what-we-do/environment-and-climate>



Photo: Jyldyz Shigaeva

Sustainable Walnut Forests in Kyrgyzstan

The project funded by German Federal Ministry of Education and Research (BMBF), *Analysis and sustainable utilization of the nutritional potential and secondary plant compounds in underutilized plant species of walnut-fruit forests of Kyrgyzstan (SUSWALFOOD)*, aimed to improve food security, promote sustainable management of forest resources, and investigate new sources of income for local populations. Within this project, MSRI has studied the socio-economic aspects of wild walnut forest management in the countries along the Silk Road routes, with a special focus on Kyrgyzstan.

The study revealed that the Kyrgyz walnut forests are currently facing serious environmental and health threats due to unsustainable patterns of forest management. More than 1.2 million people depend on walnut-fruit forests and local communities show less interest in reproducing walnut trees as there are no incentives for reforestation. However, the potential to develop nutritious food from wild plant species (fruit trees, shrubs, herbs) of Kyrgyz walnut forest ecosystems has been neglected, although it could contribute to improved food security and raise incomes of local smallholder farmers.

The development of new economic ventures will decrease the anthropogenic burden on walnut forests and reduce environmental risks. At the same time an integrated ‘science-business’ approach is needed to promote sustainable forest management through application-oriented research and establishment of new marketing opportunities for local populations.



Photo: Aziz Ali Khan

Climate Change Adaptation in Afghanistan

MSRI is partnering with AKF-Afghanistan (AKF-Afg) and the Wildlife Conservation Society (WCS) in the project on “Addressing climate change in Afghanistan through sustainable energy and ecosystem management” funded by the European Commission. MSRI, working closely with partners and reaching out to Afghan Government agencies (NEPA and MAIL) and NGOs, made progress in implementing the climate vulnerability assessment in northern Afghanistan – this work continues into 2020. Seven Community Development Councils have implemented local watershed management plans within the Panj-Amu River basin focused on adaptation strategies. MSRI provided guidance based on experience from Kyrgyzstan and Tajikistan on participatory planning in integrated watershed management in a May 2019 workshop in Iskashim. Collection of spatial data on land use, ecosystems, hydrology, energy use, climate patterns, stocking rates and grazing patterns commenced, and an initial analysis reveals that available data on land cover and land use needs to be used with care, and improvements will be necessary using remotely sensed satellite data analysis since land use information is crucial for the context of this project. Locally measured and collected hydrological data is very sparse, and topography-based modelling approaches may become necessary as surrogates. MSRI, together with WCS and NEPA, engaged in initial technical reviews of monitoring system needs and specification with this work continuing into 2020.

Some of the early outcomes of this collaborative project include:

- Promoting participatory planning in integrated watershed management and ecosystem-based adaptation and sustainable management
- Supporting dryland communities to increase productivity of rain-fed agriculture and orchards
- Building capacity for woodland management and restoration, including woman’s groups
- Enhancing rangeland management by promoting improved community-based livestock husbandry and involvement of youth and women

Hosting Arrangements



Photo: Maksim Kulikov



Photo: Alma Uzbekova

ICRAF – World Agroforestry Centre

MSRI hosts the Central Asia Office of World Agroforestry Centre (ICRAF), launched in 2014 in Bishkek, operating as a country office under the ICRAF Regional Office for East and Central Asia. On 31 July 2019, the ICRAF Central Asia Office Central Asia closed the *Agroforestry systems in irrigated agriculture in Central Asia for building resilience against water stress and climate change project*. On 7-9 October 2019, a workshop on “Poplars in Agroforestry in Central Asia – from Planting Material to Utilization” was held for ICRAF stakeholders and partners to bring partners together and present results of growth rates, yield potential, and other experiences from different experimental plots.



ICRAF East & Central Asia: <http://www.worldagroforestry.org/region/east-central-asia>

Aarhus Centre, Naryn Kyrgyzstan

On 5 November 2019, the fourth Kyrgyz Aarhus Centre was officially opened in Naryn as part of a cooperation between the OSCE Programme Office in Bishkek and the University of Central Asia’s Graduate School of Development. The Centre serves as a bridge between local governmental authorities and the local community while addressing the most acute environmental challenges in Naryn region. It will implement the Aarhus convention in Kyrgyzstan, fostering open access to environment data, promoting public participation in decision making, and ensuring the right to live in healthy environment. The Aarhus Convention was signed in 1998 and has been ratified by 45 European and Central Asian countries. Until now, co-operation of the existing Aarhus Centres in Osh (2004), Bishkek (2015) and Issyk-Kul (2017) resulted in outputs such as building networks and working together in a coordinated and effective manner with a wide range of stakeholders. The Aarhus Centres have drawn wide public attention on environmental issues and have provided unique platforms for dialogue among public, civil society, local authorities, media, and relevant experts.



More information: <https://ucentralasia.org/Resources/Item/2491/EN>



MSRI Hosted Events and Educational Activities in 2019

Photo: Alma Uzbekova



Photo: Emil Akhmatbekov

“Current Dynamics of the Border Areas in the Fergana Valley”

Workshop, Bishkek, Kyrgyzstan, 13 February 2019.

On 13 February 2019, MSRI held a workshop “Current Dynamics of the Border Areas in the Fergana Valley”. Forty experts from Kyrgyzstan, Tajikistan, Uzbekistan and the UK participated in this one-day event, focused on different aspects of local community life in the transboundary areas of Kyrgyzstan, Tajikistan, and Uzbekistan.

Participants discussed current developments and impacts anticipated from opening borders with Uzbekistan in 2017. What changes occurred in the region? How does the transboundary water cooperation system respond to the new situation? How do local communities in transboundary areas perceive these changes, and what difficulties exist that are preventing the restoration of former social and economic links? These were discussed following presentations by experts and MSRI field researchers on findings and case studies conducted in the transboundary communities of Uzbekistan, Tajikistan and Kyrgyzstan.

The workshop was organized in the framework of MSRI’s project *Improving Stability and Better Natural Resource Management in Kyrgyzstan and Tajikistan*, implemented under the support of the UK Government and in the partnership with Aga Khan Foundation.



More information: <https://ucentralasia.org/Resources/Item/2102/EN>

Photos available at: <https://www.flickr.com/photos/143190465@N02/sets/72157703352829272>



Photo: Reiko Kodama

Second Summer University on Disaster Risk Management

GBAO, Tajikistan, 16-28 June 2019.

Over 20 participants from Tajikistan, Kyrgyzstan, Kazakhstan, Pakistan, India and the United States came together for the second international Summer University (SU) on Disaster Risk Management in Khorog, Tajikistan, organized by the Aga Khan Agency for Habitat (AKAH) and MSRI, and conducted in collaboration with the University of Bern of Switzerland and the University of Natural Resources and Life Sciences in Vienna.

SU 2019 focused on theoretical and practical frameworks for the integration amongst scientific, economic, social, and governance aspects of Disaster Risk Reduction (DRR), Integrated Watershed Management and Implementation, and Climate Change Adaptation (CCA). Throughout the SU, participants from different academic and technical backgrounds explored the importance of synergy between DRR and sustainable development planning through various themes, including assessing the effects of land management practices on various natural hazards, developing risk reduction concepts based on changing natural and socio-economic conditions, as well as considering people's perception of risks and their willingness to invest in increased resilience.

The classroom portion of the course focused on understanding natural hazards, vulnerabilities, resilience, as well as the interrelation between sustainable development and disaster risk reduction. Field trips around the Khorog area to various hazard sites were conducted as well as a multi-day excursion to the Muminabad region of Khatlon Oblast, an area exposed to various hazards. This latter trip shed light on soil and land degradation processes and demonstrated how unsustainable watershed management practices can lead to environmental degradation.



More information: <https://summeruniversity2019.msri.io/index.html>



Photo: UCA

Natural Resources Management course for Executive Master's Programme in Development Policies and Practices

Naryn, Kyrgyzstan, 28 July – 2 August 2019.

MSRI provided a special course on Natural Resource Management for the participants of the international “Executive Master's Programme in Development Policies and Practices” (DPP), conducted by the Graduate Institute in Geneva. For one week, sixteen learners from Tajikistan, Kyrgyzstan, Mongolia, Armenia and Georgia participated in intense interactive training sessions and field work in and around the UCA Naryn campus. These sessions focused on governance and management concepts in the context of global change and exploring novel pathways towards a more resilient future with an eye on achieving goals of the 2030 Agenda. The international DPP Executive Master's program is designed for mid-career to senior career professionals working in the field of development who aspire to leadership positions.



More information: <https://www.ucentralasia.org/Publications/Item/2340/EN>



Photo: Roy Sidle

“Dynamic Mountain Environments”

Course at UCA, Khorog, Tajikistan.

During Fall Semester 2019, Professor Roy Sidle taught a 2 credit course on “Dynamic Mountain Environments” to 21 UCA Earth and Environmental Science students.

The course outlined the interactive components of the Earth system (atmosphere, cryosphere, biosphere, lithosphere, pedosphere, and hydrosphere) and introduced landforms and how these are modified by Earth processes. Focus was on dynamic hillslope and fluvial processes in mountain ecosystems and how these processes change and evolve over different spatial and temporal scales, with an emphasis on contemporary dynamics, human impacts, and potential effects on mountain communities.

A field trip near Khorog provided a better understanding of active hydrogeomorphic processes and impacts and their interactions with those in the biosphere and atmosphere.



Photo: Ben Jarihani

“Climate Change”

Course at UCA, Khorog, Tajikistan.

During Fall Semester 2019, Dr. Ben Jarihani, MSRI Senior Research Scientist, taught “Science, Impact and Complexity of Climate Change” course for the Earth and Environmental Sciences (EES) students.

This course is offered on the third year of the EES program to junior students and teaches them to critically evaluate current understanding of global climate change and analyze, question, and synthesize knowledge about this topic. This course also investigates the scientific evidence of global warming, examines the causes of climate change, considers the impacts on natural and human systems, and explores options of mitigation and/or adaptation to changing climatic conditions, particularly in the mountain regions of Central Asia.

A field trip to a Khorog weather station provided a better understanding of how thermometers, rain gauges, and other instruments are used to keep a record of climate parameters.

Conferences & Workshops attended by MSRI staff in 2019

“Current Dynamics of the Border Areas in the Fergana Valley” Workshop, Bishkek, Kyrgyzstan, 13 February 2019, <https://ucentralasia.org/Resources/Item/2102/EN>

“Analysis and sustainable utilization of the nutritional potential and secondary plant compounds in underutilized plant species of walnut-fruit forests of Kyrgyzstan (SUSWALFOOD)” Workshop, Bishkek, Kyrgyzstan, 19-20 February 2019

Development Dialogue on “Comprehensive Long-Term Evidence-Based Migration Policy for the Kyrgyz Republic”, Bishkek, Kyrgyzstan, 1 March 2019, <http://en.kabar.kg/news/development-dialogue-addresses-migration-policy-in-kyrgyzstan/>

International workshop “Opportunities and challenges for implementing agroforestry systems: Developing a decision support framework for policy-makers in Central Asia”, Islamabad, Pakistan, 11-13 March 2019

UNESCO Regional Workshop on Mobilization of Youth and Young Professionals in Science for Disaster Risk Reduction in Central Asia, Almaty, Kazakhstan, 12-14 March 2019, <https://cesdrr.org/en/2019/03/15/young-people-on-the-role-of-science-in-disaster-risk-reduction/>

CARB-Asia kick-off meeting “Development of methods for organic carbon stock assessment and improvement of climate change reporting on agricultural ecosystems in Kyrgyzstan”, Bishkek, Kyrgyzstan, 29 March 2019, <https://www.agrar.hu-berlin.de/en/institut-en/departments/daoe/ress-en/news/carbasiakickoff>

Population Assessment of the World’s Snow Leopards Initiative Roundtable, Bishkek, Kyrgyzstan, 3-4 April 2019

Co-organized a session on “Connectivity in geomorphology, hydrological and soil systems sciences: concepts, methods and societal implications”, European Geosciences Union General Assembly, Vienna, 7-12 April 2019, <https://meetingorganizer.copernicus.org/EGU2019/orals/30447>

Sustainability Assessment of the Water–Energy–Food Nexus for Irrigated Agriculture: Interdisciplinary Approaches for Central Asia (WEFCA) Summer School on Water Energy Food nexus in Central Asia, Tashkent, Uzbekistan, 28 April – 5 May 2019, <http://www.caiag.kg/en/news/308-summer-school-tashkent-en>

AKF Tajikistan Training on Conservation Agriculture: land and soil fertility management for sustainable crop production, Javshangoz, Tajikistan, 5-8 May 2019

“Migration: Deeper understanding, better responses” policy dialogue, Brussels, Belgium, 7-8 May 2019, <http://maris.iwmi.org/events/migration-deeper-understanding-better-responses/>

Regional Conference of the joint Tajik-Kyrgyz-German research initiative “Balancing and optimization of multifunctional use of Juniper forests in Central Asia”, Ayni, Zerafshan, Tajikistan, 28-31 May 2019

3th Annual International GIS-in-Central-Asia Conference (GISCA’19): From Spatial Data to Spatial Intelligence, Bishkek, Kyrgyzstan, 31 May-1 June 2019, <https://gisca2019.wordpress.com/>

International conference: “Current and Future State of Water Resource Management and Environmental Issues in Central Asia”, Bishkek, Kyrgyzstan, 10 June 2019, https://auca.kg/en/auca_news/3761/

Second Disaster Risk Management Summer University 2019, GBAO and Khatlon, Tajikistan, 16-28 June 2019, <https://summeruniversity2019.msri.io/index.html>

AGRUMIG Project meeting Qualitative Comparative Analysis training, Vienna, Austria, 17-21 June 2019

IPROMO 2019 Summer School: Landscape approach for enhancing mountain resilience, Ormea and Pieve Tesino, Italy, 2-18 July 2019, <http://www.fao.org/forestry/news/96023/en/>

PALESCA Second Summer School on “Learning Landscapes through Environmental Research and Monitoring”, Naryn, Kyrgyzstan, 3-11 July 2019, <https://flic.kr/s/aHsmENLkAS>

Natural Resources Management course for Executive Master’s Programme in Development Policies and Practices, Naryn, Kyrgyzstan, 28 July – 2 August 2019, [https://www.ucentralasia.org/Content/downloads/UCA%20News%20September%202019%20Issue%2009-19%20\(Eng\).pdf](https://www.ucentralasia.org/Content/downloads/UCA%20News%20September%202019%20Issue%2009-19%20(Eng).pdf)

Roundtable “Evaluating Outcomes in Fragile Contexts: Improving Research and Impact Assessment Approaches”, London, UK, 27 September 2019, <https://www.chathamhouse.org/event/evaluating-outcomes-fragile-contexts-improving-research-and-impact-assessment-approaches>

FAO Livestock Adaptation Assessment, Tashkent, Dushanbe, Bishkek, 30 September – 4 October 2019

The second Conference on “Disaster Risk Reduction: Challenges and ways of solutions”, Bishkek, Kyrgyzstan, 4 October 2019, <http://ru.mes.kg/2019/10/04/ii-konferenciya-snizhenie-riska-bedstvij-vyzovy-i-puti-resheniya-posvyashhennaya-dnyu-snizheniya-riska-bedstvij-v-kyrgyzskoj-respublike/>

Workshop “Poplars in Agroforestry in Central Asia – from Planting Material to Utilization”, Bishkek, Kyrgyzstan, 7-9 October 2019

20th Annual Central Eurasian Studies Society Conference (CESS 2019), Washington, D.C., USA, 10-13 October 2019, <https://www.centraleurasia.org/conferences/annual/past/>

Sustainability and Development conference 2019, Ann Arbor, MI, USA, 11-14 October 2019, <https://umsust-dev.org/2019-conference/>

PALESCA Final Workshop, Bishkek, Kyrgyzstan, 24 October 2019

The High Mountain Summit (WMO), Geneva, Switzerland, 29-31 October 2019, <https://sdg.iisd.org/news/high-mountain-summit-calls-for-action-science-to-protect-the-worlds-water-towers/>

Round table “Opening of Aarhus Centre in Naryn”, 5 November 2019, <http://aarhus.kg/en/news/4th-aarhus-center-opened-in-kyrgyzstan.html>

Keynote presentation on “New observations, approaches, and understanding of hydrogeomorphic processes: examples from Japan, Australia, and Central Asia” at the Japanese Geomorphological Union 40th Anniversary Meeting, Nov. 8-10, Kyoto, Japan

EU-Central Asia Network for Water Science and Technology Thematic Workshop “Water quality”, Bishkek, Kyrgyzstan, 12 November 2019, <https://carececo.org/en/main/activity/events/eu-central-asia-network-for-water-science-and-technology/>

Invited keynote presentation on “Assessment of Hydrogeomorphic Hazards in the Context of Sustainable Land Management”, Global Innovation Research Symposium, Tokyo University of Agriculture & Technology, Fuchu, Japan, 19 November 2020, <https://en.tuat-global.jp/event/3597/>

Workshop “Studying Border Regions in the Post-Soviet Space Different Methods, Scales and Areas”, Tbilisi, Georgia, 26-28 November 2019, <https://www.hsozkult.de/event/id/termine-41778>

Invited open seminar on “Hydrogeomorphic processes and hazards in high mountain environments”, Institute of Global Innovation Research, Tokyo University of Agriculture & Technology, Fuchu, Tokyo, Japan, 27 November 2020, <https://en.tuat-global.jp/event/3672/>

Panel discussion: “Migration, Agriculture and Rural Development: Experiences from China, Ethiopia, Kyrgyzstan and Morocco”, Kathmandu, Nepal, 6-14 December 2019

Publications in 2019

MSRI Briefs

Murzakulova, A. (July 2019) “Lessons learned from interventions in areas of medium and high intensity conflicts: A case study of Vorukh (Tajikistan) and Ak-Sai (Kyrgyzstan)”. Mountain Societies Research Institute, University of Central Asia, <https://www.ucentralasia.org/Research/Item/2332/EN>

Murzakulova, A., Omorova, G., Shibkov, E. (May 2019). “Reconsidering the Meaning of Neighbourship: The Transformation of Uzbekistan-Kyrgyzstan Border Areas after 2016”. Mountain Societies Research Institute, University of Central Asia, <http://bit.ly/MSRI-PB4>

Refereed Journal Publications

Asadi, H., Shahedi, L., **Jarihani, B., and Sidle, R.C.** (2019). Rainfall-runoff modelling using hydrological connectivity index and artificial neural network approach. *Water* (11) 212, <https://doi.org/10.3390/w11020212> IF = 2.54

Asadi, H., Shahedi, K., **Sidle, R.C.**, and Heris, S.M.K. (2019). Suspended sediment modelling using intelligence models and index of connectivity. *Iran Water Resources Research* (accepted, in Persian with English abstract).

Azarov, A., Maurer, M. K., **Weyerhaeuser, H.**, & Darr, D. (2019). The impact of uncertainty on smallholder farmers' income in Kyrgyzstan. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 120(2), 183–195, <https://doi.org/10.17170/kobra-20191127816>

Blöschl, C., Bierkens, M. F.-P., Chambel, A., Destounmi, G., Fiori, A., Kirchner, J.W., **Jarihani, B.**, **Sidle, R.C.**, Skaugen, T., et al. (2019). Twenty-three unsolved problems in hydrology (UPI) – a community perspective. *Hydrol. Sci. J.* 64(10): 1141-1158, <https://doi.org/10.1080/02626667.2019.1620507> IF = 2.18

Hardy, K., **Thevs, N.**, **Aliev, K.**, and Welp, M. (2019). Afforestation and Reforestation of Walnut Forests in Southern Kyrgyzstan: An Economic Perspective. *Mountain Research and Development* 38(4): 332-341. <https://doi.org/10.1659/MRD-JOURNAL-D-17-00046.1> IF = 1.388

Kharismalatri, H.S., Ishikawa, Y., Gomi, T., **Sidle, R.C.**, and Shiraki, K. (2019). Evaluating factors controlling sediment connectivity of landslide materials: a flume experiment. *Water* 11, 17, <https://doi.org/10.3390/w11010017> IF = 2.54

Miyata, S., Gomi, T., **Sidle, R.C.**, Hiraoka, M., Onda, Y., Yamamoto, K., and Nonoda, T. (2019). Assessing spatially distributed infiltration capacity to evaluate storm runoff in forested catchments: implications for hydrological connectivity. *Sci. of the Total Environment* 699: 148-159, <https://doi.org/10.1016/j.scitotenv.2019.02.453> IF = 5.589

Moresi, F.V., Maesano, M., Matteucci, G., Romagnoli, M., **Sidle, R.C.**, and Scarascia Mugnozza, G. (2019). Root biomechanical traits in a montane Mediterranean forest watershed: variations with species diversity and soil depth. *Forests* 10, 341, <https://doi.org/10.3390/f10040341> IF = 2.116

Nespoulous, J., Merino-Martín, L., Monnier, Y., Bouchet, D., Ramel, M., Dombey, R., Viennois, G., Mao, Z., Zhang, J.-L., Cao, K., Le Bissonnais, Y., **Sidle, R.C.**, and Stokes, A. (2019). Tropical forest structure and understorey determine subsurface flow through biopores formed by plant roots. *Catena* 181, 104061, <https://doi.org/10.1016/j.catena.2019.05.007> IF = 3.85

Sidle, R.C., Al-Shaibani, A.M., and Kaka, S.L. (2019). Geomorphic hazards in south-west Saudi Arabia: the human – environmental nexus. *Area* 51(4): 670-680, <https://doi.org/10.1111/area.12509> IF = 2.13

Sidle, R.C., Greco, R., and Bogaard, T. (2019). Overview of landslide hydrology. *Water* 11, 148, <https://doi.org/10.3390/w11010148> IF = 2.54

Sidle, R.C., **Jarhani, B.**, Kaka, S.L., Koci, J., and Al-Shaibani, A.M. (2019). Hydrogeomorphic processes affecting dryland gully erosion: implications for modelling. *Progress Phys. Geog.* 43(1): 46-64, <https://doi.org/10.1177/0309133318819403> IF = 4.34

Thevs, N., Gombert, A., Streng, E., Lleshi, R., **Aliev, K.**, & Emileva, B. (2019). Tree Wind Breaks in Central Asia and Their Effects on Agricultural Water Consumption. *Land*, 8(11), 167, <https://doi.org/10.3390/land8110167> IF = 2.429

Wilson, B., Mills, M., **Kulikov, M.**, and Clubbe, C. (n.d.). (2019). The future of walnut–fruit forests in Kyrgyzstan and the status of the iconic Endangered apple *Malus niedzwetzkyana*. *Oryx*, 1-9. <https://doi.org/10.1017/S0030605318001230> IF = 2.199

Yang, A. L., Djoudi, H., & **Bakhtibekova, Z.** (2019). Understanding migration and remittance to improve forest management projects and policies: Synthesis Report: Tajikistan. Understanding migration and remittance to improve forest management projects and policies: Synthesis Report: Tajikistan. CIFOR. Retrieved from <https://www.cifor.org/library/7409>

Zhu, X., Liu, W., Chen, J., Bruijnzeel, L.A., Mao, Z., Yang, X., Cardinael, R., Meng, F.-R., **Sidle, R.C.**, Seitz, S., Nair, V.D., Nanko, K., Zou, X., Chen, C., and Jiang, X.J. (2019). Reductions in water, soil and nutrient losses and pesticide pollution in agroforestry practices: a review of evidences and processes. *Plant and Soil*, DOI: [10.1007/s11104-019-04377-3](https://doi.org/10.1007/s11104-019-04377-3) IF = 3.26

Book & Book Chapters

Murzakulova, A., **Schmidt-Vogt, D.**, Balla, D., Darr, D., Hamidov, A., Kasymov, U., Mendelevitch, R., Orazgaliyev S. (2019) Water for Agriculture and other Economic Sectors. In Xenarios, S., Schmidt-Vogt, D., Qadir, M., Janusz-Pawletta, B., Abdullaev, I (Eds.), *The Aral Sea Basin: Water for Sustainable Development in Central Asia*, Earthscan Series on Major River Basins of the World, Routledge Publ. ISBN: 978-1-13-834888-2

Rosset, A. (2019). Experimenting with Openness as a seed for social transformation: Linking environmental education and citizen science in remote mountain villages of Kyrgyzstan. In L. Chan (Ed.), *Contextualizing openness: situating open science* (pp. 267–289). Ottawa: University of Ottawa Press.

Baibagyshov, E. (2019). *Izuchenie i otzhenka pochvy cherez experimenty* (Soil study and evaluation through experiments). Mountain Societies Research Institute, University of Central Asia. Available at: <https://ucentralasia.org/Content/Downloads/Soil%20Manual-RUS-web.pdf>

Wang Y., Wu N., Kunze C., Long R., and Perlik, M. (review editor **Foggin, M.**). (2019) Drivers of Change to Mountain Sustainability in the Hindu Kush Himalaya. Chapter 2 in: Wester P., Mishra A., Mukherji A., Shrestha A. (eds.) *The Hindu Kush Himalaya Assessment*. Springer, Cham.

Other Publications

Thieme, S. & **Murzakulova, A.** “Migration, multilocality and the question of return in Kyrgyzstan”. In Bachmann, F., Maharjan, A., Thieme, S., Fleiner, R., & Wymann von Dach, S., eds. 2019. *Migration and Sustainable Mountain Development: Turning Challenges into Opportunities*. Bern, Switzerland, Centre for Development and Environment (CDE), University of Bern, with Bern Open Publishing (BOP). 72 pp.



MSRI Team

Mountain Societies Research Institute



Professor Roy Sidle
Director

Hydrology, Natural Hazards, Earth Surface Processes, Environmental Sciences, Sustainability, and Natural Resource Management in five continents: North America, South America, Europe, Asia, and Australia.



Ben Jarihani
Senior Research Scientist

Dr. Ben Jarihani joined MSRI as a Senior Research Scientist in August 2019 from University of the Sunshine Coast in Australia where he was a Senior Research Associate with the Sustainability Research Centre. He is also 50% cross appointed as Assistant Professor in Earth and Environmental

Sciences at UCA. Ben holds undergraduate and Master's degrees in water resources engineering from Iran and a PhD in hydrological science from the Geography Department at University of Queensland, Australia. During his PhD, he focused on novel applications of remotely sensed data and spatial sciences to better understand the hydrological and hydrodynamic conditions of large dryland catchments within central Australia. He has more than 20 years of consulting, research, teaching, and project management experience in hydrology, spatial science, and natural resources management. His skills in

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Photo: Ben Jarihani



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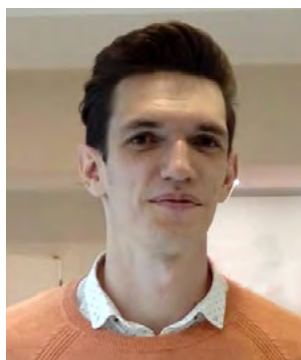
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