



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

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Annual Report 2020



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MSRI Mission

The Mountain Societies Research Institute (MSRI) applies science expertise to study complex earth surface and environmental processes that affect mountain societies. Its interdisciplinary research focuses on improving livelihoods, managing natural resources, mitigating the effects of natural hazards and climate change, and building community resilience in these challenging environments. Headquartered at the Khorog, Tajikistan UCA campus, MSRI staff also teach classes at the undergraduate Earth and Environmental Sciences Department. MSRI is part of University of Central Asia's (UCA's) Graduate School of Development.

Mountain Societies Research Institute, University of Central Asia

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On the cover (front): View of Vakhsh River in Northeast Tajikistan above Poghon Dam showing deep tributary incision in soft terrace sediments. Photo by Ben Jarihani

On the cover (back): Network of mountain roads emerging from a small village along the Panj River, Tajikistan. Note the level of disturbance and erosion associated with these poorly planned roads.

Photo: Roy Sidle

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Director's Message

In my 48 years of research, I have never experienced a year like 2020, and unfortunately, the concerns of the ongoing pandemic persist into 2021. Many dedicated University of Central Asia (UCA) staff members have suffered and are still suffering from this pandemic. My best wishes go out to all of them. To say we have accomplished what we hoped for at the onset of 2020 would be ambiguous at best. Despite all the international rhetoric promoting the virtues of online meetings and teaching, it has been very disappointing, unfruitful, and time consuming not have ready access to colleagues, students, and research venues. Personally, I was working outside Central Asia for half of the year, as were most other international UCA researchers and faculty. In the face of this adversity, I applaud our MSRI researchers and staff for adapting as best they could to this unique challenge. We pressed on to complete much of our field work in spring 2020 and those of us who were teaching stayed on until the end of Spring semester 2020 to make sure our UCA Earth and Environmental Science students could finish the year in a "normal manner". MSRI published 33 papers and books in 2020, 17 in refereed international journals, six MSRI Reports or Briefs, nine other papers, and one edited textbook. Thus, my message to the MSRI team is a huge thank you for your continuing dedication to our important research, as well as your efforts to responsibly adapt to a situation that was heretofore unknown.

In 2020, MSRI continued discussions related to future research collaborations in Tajikistan with the following organizations: (1) Pamir Energy; (2) JICA Tajikistan; (3) AKF and AKAH – Tajikistan; (4) Center for Innovative Development of Science and New Technologies of the Tajik Academy of Sciences; (5) Institute of Soil Science of Tajik Academy of Agricultural Sciences; and (6) Department of Meteorology and Climatology of the Tajik National University. MSRI submitted proposals through JICA/Japan Science & Technology Agency (SATREPS); Horizon 2020 (the largest EU Research and Innovation programme), and the Swiss Development Cooperation. Through the "Pathways to Innovation..." project funded by International Development Research Centre (IDRC Canada), MSRI continued its effective partnership with the Khorog State University in Tajikistan and Badakhshan University and Bamyan University in Afghanistan where selected fellows successfully implemented research on food security, livelihood improvement, and environmental resource conservation. MSRI staff continues to work closely with these researchers to finalize the reports and prepare them for publication on MSRI's website and for submission to scientific journals. A short conference and graduation ceremony was planned for June 2020 for individuals who completed the IDRC Certificate Programme in Natural Resources Management but due to the COVID-19 pandemic and associated restrictions, the conference was adapted to an online format.

MSRI also continued its collaboration with the Global Environment Facility Small Grants Programme (GEF SGP) on development of a Country Strategy for the Programme in Kyrgyzstan. MSRI organized a workshop in March 2020 in Bishkek attended by more than 40 representatives from State Environment Protection bodies, NGOs, and academia to identify



priority environmental development areas in Kyrgyzstan. As a result, Osh and Batken provinces of Kyrgyzstan were selected as target landscapes. MSRI findings will help guide GEF to allocate funds that reflect the needs and requirements of local communities in the areas of natural resource management, local infrastructure, water management, hazardous waste management, and sustainable sources of income.

In cooperation with UNEP, MSRI developed a study tour to advance and strengthen transboundary collaboration and support implementation of the provisions of the Memorandum of Understanding (MoU) on environmental cooperation between the governments of Afghanistan and Tajikistan in the upper Panj Amu Darya Basin. Experts from both countries specializing in biodiversity and protected area management, climate change adaptation, landscape and watershed management, water quality, and environmental impact assessment were selected to participate in the study tour that was planned for the first part of October 2020 across the upper catchment of the upper Panj Amu Darya River Basin in the Pamirs. However, due to the pandemic restrictions, the event has been postponed until late summer 2021.

During 2020, MSRI welcomed two new researchers into our fold. Drs. Arnaud Caiserman and Aslam Qadamov joined MSRI to work on several ongoing projects, as well as to bring their expertise and interests in sustainable agriculture, geography, remote sensing, and cold region hazards to support our continuing search for new research areas and assist with student mentoring. While MSRI was not able to conduct any short courses in 2020, several of us taught courses in the Earth and Environmental Sciences major at UCA – in Spring semester in the classroom and during Fall semester online. We are looking forward to better working conditions in 2021.

Roy C. Sidle

Director of MSRI
Professor of Earth and Environmental Sciences
University of Central Asia



Photo: Roy Sidle

Mountain Societies Research Institute

Central Asia's vast mountain ranges provide 90% of the region's water, are rich in biodiversity and mineral wealth, support the Water Towers of the region, and are home to unique cultural communities that face difficult futures. Many of the natural hazards and related disasters that have always occurred in these mountains are accelerating because of poor land management and climate change. Creating sustainable livelihoods and building community resilience under these conditions is challenging.

MSRI's mission is to generate knowledge for practical applications to tackle the myriad of interrelated issues facing mountain communities.

Headquartered at UCA's Khorog campus in Tajikistan, MSRI staff also teach in the undergraduate Earth and Environmental Sciences Department. MSRI also has offices in Bishkek, Kyrgyzstan and Dushanbe, Tajikistan.

Research Areas

MSRI's research expertise and focal areas include:

- **Natural hazards and disaster mitigation:** hazard risk assessment and modelling, climate change effects; glacial and permafrost hazards; landslides and debris flows; remote sensing applications
- **Water supplies and management:** climate change impacts on water sources; snow accumulation trends; flood mitigation management; water sources in cold regions; sediment sources, transport, and impacts
- **Natural resources management:** food security; climate-smart agriculture; reversing land degradation; biodiversity; soil erosion; reforestation
- **Mountain livelihoods and social dynamics:** cross-border relations; gender equity; migration; sustainable infrastructure; natural resources governance; value-chain development; climate change adaptation.



Photo: Asel Murzakulova

MSRI Projects in 2020

Rural Migration During Pandemic

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

Kyrgyzstan historically is an agrarian country. However, the contribution of agriculture to the country's GDP has dramatically decreased from 43.9% in 1996 to 12.1% in 2019, while employment in agriculture also steadily declined, peaking at 52.4% in 2000, but dropping to 18% in 2019. In the same period, rural residents, accounting for 65% of the country's population, began to actively develop external labor markets. According to the State Migration Service under the Government of the Kyrgyz Republic, 740,500 Kyrgyzstan citizens were registered as migrants in 2018. The main destination countries for migrants are Russia and Kazakhstan; minor flows of migrants go to Turkey, USA, Italy, South Korea, Germany, UAE, and Great Britain. In the last decade, several trends were identified in the flow of labor migration. Single men predominantly migrated in the early 2000's, while after 2011 there was a trend toward family migration and female migration.

The [AGRUMIG project](#) initiated in 2019 within a consortium led by SOAS, University of Birmingham, and IWMI (International Water Management Institute) and supported by European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 822730 focuses on understanding

migration dynamics by investigating the nexus amongst rural migration, agrarian change, and rural transformations in Kyrgyzstan. In addition, this research contributes to the comparative analysis of the seven countries' rural contexts – Kyrgyzstan, China, Thailand, Morocco, Nepal, and Moldova. Recommendations for improvement of migration policies are being developed at regional and national levels. In 2020, MSRI and partner organizations published two research reports and a book-chapter available on [MSRI's website](#) and the [AGRUMIG webpage](#). Additionally, MSRI conducted household surveys in Batken, Jalal-Abad, and Naryn oblasts from October to December 2020 covering 303 rural households. Within the framework of the project MSRI produced an [animated video](#) on "Impact of Migration on Rural Development in Kyrgyzstan", which was disseminated among all stakeholders. The research team also actively contributed to the public debate on Migration Policy in Central Asia by participating in the following productions: (1) [TV Show "Real Economy"](#); (2) IWMI "[Migration and COVID19: disruptions and policy impacts](#)" webinar; and (3) OSCE Academy webinar on "[The impact of COVID -19 on migration and migration governance in Kyrgyzstan](#)".



Photo: Ben Jarihani

Land Degradation and Water Resources Management

In 2020, MSRI successfully secured two interrelated projects funded by the World Bank on: “Catchment characterization in the Vakhsh basin upstream of Nurek Reservoir, Tajikistan” and “Mapping and Valuing Ecosystems Services, and Prioritizing Investments in Select Watersheds in Tajikistan to support Sustainable Hydropower”. The main objective of these projects is to understand erosion

sources and processes in Vakhsh River Basin above Nurek Dam and estimate the sediment loads to the dam reservoir. Another project, also funded by the World Bank, on “Crop Yield Forecasting using Remote Sensing in Tajikistan” aims to develop and test a methodology for predicting the yield of primary agricultural crops, at the district level and at the level of several large reference dekhkan farms.

Catchment Characterization in the Vakhsh Basin Upstream of Nurek Reservoir, Tajikistan

Tajikistan has significant water resources that the government exploits through major dams, among the largest and highest in the world. This is notably the case of the Nurek dam on the Vakhsh River, built for hydroelectric purposes but also for agricultural irrigation. This dam alone can produce 3,000 MW, one of the largest dams in Central Asia. However, sedimentation of this and other reservoirs in the Vakhsh basin will ultimately reduce the reservoirs volume and limit the hydroelectric potential of these huge investments. High levels of sedimentation results from extensive gully erosion in the catchment, as well as landslides and more chronic erosion from agriculture and rangelands. MSRI conducted a preliminary survey of the catchment upstream of

the Nurek Reservoir to identify the primary sources of these sediments. Additionally, MSRI has been collecting water samples on a bi-monthly basis from selected sites within the Vakhsh River starting in April 2020. This sampling has continued, and the collected samples are being analyzed for suspended solids. As this sedimentation database is being generated, MSRI will have some of the only spatial and temporal information on sediment transport in this important river system. Furthermore, these data will help identify the sources of these sediments and thus inform whether management actions can be implemented to mitigate the sedimentation of the downstream reservoirs.



Photo: Ben Jarihani

Mapping and Valuing Ecosystems Services and Prioritizing Investments in Select Watersheds in Tajikistan to Support Sustainable Hydropower

This associated project funded by the World Bank also focuses on sediment issues in the Vakhsh River basin. In this project, catchment geomorphic characteristics and land uses were assessed and are being correlated with the results of the riverine sediment analysis. In 2020, MSRI produced a high resolution (10 m) land use map of the entire area, which facilitates comparison and interconnections with areas that are susceptible to soil erosion. The field geomorphologic assessment identified areas of very active erosion, including gullies, landslides, and debris flows within portions of the catchment.

In addition, MSRI produced a Snow Persistent Index map that provides information on the extent of snow cover in the catchment and the timing of snowmelt, a key factor in the seasonality of sedimentation. In parallel, geology and hydrology data were compiled and collected throughout 2020. All these results contributed to the interim World Bank report in 2020 and constitute an important dataset to assess sedimentation rates in the Vakhsh River. Based on results of these two projects, MSRI is planning a summer 2021 field campaign in the catchment to collect soil/sediment samples at key sediment source areas.

Crop Yield Forecasting using Remote Sensing in Tajikistan

Climate change combined with demographic and environmental pressures are expected to have negative effects on livelihoods and food systems in Tajikistan where less adaptable, small rain-fed mountainous agricultural systems dominate. Peasant farming is the dominant production system in Tajikistan with low levels of cropland intensification, small fields, and significant between-field and within-field variability of vegetation. The project will develop classification methods for mapping land use and land cover classes, particularly rain-fed and irrigated agriculture fields, and developing a method to estimate yields of the main crops using high spatial resolution remote sensing data.

In 2020, a series of field surveys were conducted to collect data to identify land use structures for the 2019-2020 agriculture season in three pilot districts of Tajikistan. This information was used to test and validate various classification methods to delineate agriculture lands from other land cover classes. To develop a method for crop yield forecasting, yield statistics from individual fields and district levels were collected and these will be used to estimate yields of three main cultivated crops in the pilot districts. A tool is being developed to automate the process of downloading and preprocessing satellite data, land use classification, and agricultural land delineation. Also, related to capacity building, trainings on collecting field data using tablet applications were conducted for the Ministry of Agriculture field teams.



Photo: Aziz Ali Khan

Addressing Climate Change

Climate Change Adaptation in Afghanistan (E3C)

Remote mountain communities need access to better climate, weather, and streamflow data, all which affect agricultural production, natural hazards and related disasters, domestic water supplies, and livelihoods. Many Afghan villagers are subsistence farmers whose lives are increasingly impacted by the pressures of climate change and variability, which drive droughts, landslides, debris flows, snow avalanches, and flood hazards, as well as affect crop selection, grazing capacity, and land degradation.

In 2020, MSRI progressed with the Addressing Climate Change in Afghanistan (E3C) project whose overall objective is improving resilience of communities and ecosystems in the Panj-Amu Darya River basin to climate change. This work included initiating field activities to interact with target communities and fostering collaborations with partner institutions. Moreover, in cooperation with Aga Khan Foundation-Afghanistan (AKF-Afg), MSRI collected primary data on the current conditions and trends of wildlife, rangelands, forestry, and marketable medicinal plants in five districts. By collaborating as a technical partner with climate modelers, MSRI aims to make our research findings relevant and translate results of climate modelling into our outcomes.

During 2020, UCA worked closely with Wildlife Conservation Society (WCS), AKF-Afg, and various

stakeholders contributing to the development of a long-term monitoring protocol document "Methodology and process of data collection for climate change impact in Panj-Amu Darya River Basin". The implementing partners planned to present this document to Government counterparts in early 2020, but because of restrictions posed by COVID-19, this was delayed until early November 2020, when it was presented to Ministry of Agriculture, Irrigation and Livestock (MAIL) and National Environmental Protection Agency (NEPA).

The review of the current national monitoring system has proven challenging as has coordination amongst various government stakeholders related to data collection, discussions on how monitoring meets government needs, and development of a management process for the monitoring system operation. After assessing the current monitoring system and identifying gaps in environmental monitoring, new monitoring networks are planned to be installed in 2021. This initially was planned for summer 2020 but was delayed due to travel restrictions caused by the pandemic. This task resumed late in 2020 when travel was permitted. Substantial data were collected and are now being analyzed; plans for installation of field equipment are set for fall 2021 depending on accessibility.

Despite limitations posed by the pandemic, good



Photo: Maksim Kulikov

progress was made in 2020, including: (1) completion of the vulnerability assessment; (2) project protocol/indicator document was completed and submitted to the Afghanistan Government; (3) efforts to strengthen collaboration with partner institutions; and (4) acquisition of secondary data on hydrometeorology, environment, and natural resources management attributes. MSRI collected primary data on environmental resources from five project districts. MSRI also collected some secondary socioeconomic data from AKF (Afg) and AKDN. Additionally, some raw data are being collected for further analysis to extract information for assessing vulnerability. Secondary socioeconomic data collected from WCS are being reviewed and analyzed

by UCA social scientists. Because climate analysis is critical for the vulnerability assessment, MSRI has been in discussions with climate modelers at Columbia University. These discussions involve how these climate models will support MSRI's vulnerability assessments.

During 2020, thematic working groups have been established providing seamless concurrence of partner activities across the project geographies and facilitating knowledge and best practices sharing. Furthermore, a similar approach and methodology was adopted for conducting rangeland and wildlife vulnerability assessments to obtain comparable data and results from survey assessments in all areas.

Atmospheric Teleconnections and Anthropogenic Telecouplings Drive Land Change in Central Asian Highlands

The project implemented by Michigan State University jointly with the MSRI and funded by NASA strives to understand the impact that climate exerts on environmental and socio-economic conditions in highlands of Central Asia. The research attempts to elucidate the impact of pasture degradation on migration activity and vulnerability associated with environmental and economic shocks, as well as perceptions of natural hazards, including climate change and their impact on migration. To accomplish this, a joint research team planned to conduct field trips to collect environmental data and conduct socio-economic interviews in At-Bashy and Kichi-Alay valleys in Naryn and Osh provinces, Kyrgyzstan.

To conduct the socio-economic survey MSU and MSRI developed a questionnaire to cover climate change perceptions, household economies, and the potential impact on migration. The survey will be conducted using ODK software on Android tablets, which facilitates the interview process and data analysis, and helps to avoid human mistakes. A reconnaissance trip was conducted in March 2020 to Naryn and At-Bashy towns to present the project, plan field work, and identify local partners. Planned trips for data collection were postponed by MSU in due to the COVID pandemic.



Photo: Maksim Kulikov

Sustainable Use of Natural Resources

GEF - Developing the Country Programme Strategy

MSRI received a grant from the Global Environment Facility Small Grants Program (GEF SGP) to develop the Country Strategy for the Program in Kyrgyzstan. In this collaboration, MSRI will assist GEF SGP in prioritizing its program interventions in Kyrgyzstan during the Operational Phase-7 of GEF. A key element is to develop a strategic document that will guide the provision of grants to support environmental initiatives of grassroots NGOs in collaboration with leading national NGOs and government authorities. The process of developing this strategy is very participatory and will be as inclusive as possible to ensure the priorities of stakeholders are being met.

MSRI conducted a series of bilateral interviews with NGO representatives working in environmental and agricultural research and capacity building to

understand their opinions on which priority landscapes and activities GEF should focus on. A strategy document was drafted during a workshop where participants from national leading NGOs, government, and academia discussed and shared their opinions on the main components of the Strategy Plan.

The GEF SGP focuses on funding local community-led environmental projects within a priority area that includes Osh and Batken provinces of Kyrgyzstan. MSRI's SGP will review, analyze, and codify results to facilitate replication and scale up best practices within the country and in other regions. The SGP concept was first implemented in Kyrgyzstan in 2001, and 293 projects have been supported with grants totaling US\$4.6 million from that time.

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

The Pamir-Alay mountain system is a global hotspot of biodiversity where juniper forest ecosystems play significant roles. Use of firewood and degradation by pastoral practices prevent successful reforestation and jeopardize their survival, aggravated by drought stress attributed to climate change. To protect these forests, a more comprehensive study of their ecology and growth conditions was conducted to develop

integrated strategies that combine protection and sustainable use of juniper forests. This project implemented by Institute of Landscape Planning and Ecology (ILPÖ) and University of Applied Sciences for Sustainable Development Eberswalde (HNEE) jointly with MSRI is aimed at improving the capacity of forest administrations in Tajikistan and Kyrgyzstan, as well as local stakeholders, to enable



Photo: Muslim Bandishoev

the actors to sustainably use and preserve juniper forest ecosystems. The 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.

Satellite imagery was used to derive horizontal and vertical parameters of juniper stands for estimating biomass and volume, as well as the spatial distribution of juniper forests in the Pasrud catchment, northern Tajikistan. In 2020, juniper data from 24 plots were collected to build regression models to estimate above ground biomass and volume. The state of juniper forests in the project areas was modelled using spectral, textural, and vegetation indices derived from high-resolution satellite imagery. To estimate stand vertical structure, ground control points were established in the field using high precision GPS technology. As part of the juniper tree growth model development, MSRI conducted a field survey to collect cores from 190 trees. In addition, to identify an expansion factor for junipers, wood from 10 trees was collected by destructive sampling. These data were used to develop an allometric model to be further applied for estimation of above ground biomass throughout the area.

The socio-ecological component of this project is aimed at understanding of formal and informal juniper forest use rights, practices, and estimation of wood demands in Pasrud catchment. Interviews with villagers together with participatory and on-site observations were conducted at pasture camps during the 2020 season. All summer pasture camps of the catchment were visited; 13 quantitative and 7 qualitative interviews were recorded at the pasture camps. Collected data facilitated estimates of total demands for juniper wood, understanding of wood harvest practices, and the organization of juniper collection in both temporal and spatial extents. Similar to pasture interviews, 122 systematic interviews of households and observations were conducted in three selected villagers of Pasrud catchment with the aim to estimate the role that juniper plays in livelihoods and how much energy this wood comprises. Aside from household surveys, historical changes in forest and pasture management, energy prices, and cultural aspects of using juniper were discussed in open key informant interviews. These data were used to identify total amounts and spatial extent of juniper harvesting in the catchment.



Photo: Aziz Ali Khan

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

The Thrive Global Development Alliance is a five-year program that expands the Aga Khan Foundation (AKF) and United States Agency for International Development (USAID) partnership both technically and geographically in all 16 districts of Tajikistan along the Afghan border. THRIVE advances the partnership by enhancing integrated socio-economic development for men, women, boys, and girls in Khatlon Oblast and Gorno Badakhshan Autonomous Oblast (GBAO). To achieve this goal, THRIVE ensures that local governance institutions deploy resources and social services effectively through improved management of resources and social services by local governance institutions and increased access and use of quality social services in targeted communities. MSRI is implementing and supporting three research projects on food security and food systems in different environmental settings: one in Khatlon, Kulob Botanical Gardens (KBG), and two in GBAO, Pamir Biological Institute (PBI), and Pamir Agriculture Research Center (PARC).

Pamir Biological Institute Project: The PBI project on “Promotion of high yielding wheat crops through varietal screening to improve food security in the GBAO” is testing different spring and winter wheat varieties in ecological and climatic conditions of GBAO. The best performing and most promising disease resistant spring and winter wheat varieties are then screened for further propagation and dissemination among key stakeholders, such as local

farmers and governmental agriculture extension agents, as well as development NGOs in GBAO.

Kulob Botanical Gardens Project: In Shamsuddin Shohin district of Khatlon, MSRI is working with the KBG on ‘Conservation and restoration of unique local wild relatives of plants’ to identify and map the availability of wild relatives of fruit plants in mountain pastures of Shamsiddin Shohin district by organizing technical expeditions. The project aims to conserve genetic resources of local fruits and support sustainable management of wild relatives of cultivated plants through the establishment of nurseries in the project area. KBG will then transfer the technical skills on plant conservation and propagation to the local communities through capacity building programs, such as workshops and seminars by engaging technical experts.

Pamir Agriculture Research Center Project: MSRI assisted in developing a project with PARC (Academy of Sciences of Tajikistan) on the improvement of genetic and productive qualities of Pamir ecotype yaks by internal selection, evaluation, and selection of good and high-yielding animals to enhance livelihoods of the local farmers, thus contributing to poverty reduction. The project aims to improve the main genetic traits, as well as the productivity and reproductivity of indigenous yaks using genetic resources of Mongolian and Kyrgyz ecotypes by internal selection methods.



Photo: Arnaud Caiserman

MSRI Collaboration & Hosting Agreements

SDG – NEXUS Network

MSRI received a multi-year grant from the SDG nexus network through the Centre for International Development and Environmental Research (ZEU), Justin Liebig University Giessen, Germany. This grant supports the hiring of a MSRI Postdoctoral Research Associate (Dr. Aslam Qadamov) to conduct research on sustainable development goals relevant to Tajikistan.

The SDGnexus Network, consists of partners from Colombia, Ecuador, Germany, Kyrgyzstan, Tajikistan,

and Uzbekistan, providing a common research framework related to the Sustainable Development Goals (SDGs) of the United Nations and aims to analyse synergies and trade-offs among individual SDGs. A focus is to prepare the next generation of scientists by implementing a variety of teaching programs and training activities, with particular attention to the needs of junior researchers. This network is focused on interrelations among single SDGs within five focal research areas: food systems, water, urban & rural areas, natural resources, and SDG monitoring.



Photo: Samat Kalmuratov

ELSOFP Expansion of Kyrgyz, Tajik and Uzbek local smallholder organic agriculture and forest-based food products to EU Markets

MSRI in close collaboration with the Rhein-Waal University of Applied Sciences (Germany) implemented the project entitled “Expansion of Kyrgyz, Tajik and Uzbek local smallholder organic agriculture and forest-based food products to EU Markets” funded by the European Commission. The project aims to promote sustainable management of natural resources through organic production practices, which may reduce adverse impacts on climate change and enhance natural biodiversity. MSRI

contributed to increasing professional capacities of smallholder producers through developing on-line training materials. This on-line platform was designed for farmers, producers, traders, and other value chain stakeholders engaged in sustainable natural resource management, as well as the production, trade, and processing of agricultural products.

More information about the project is available at: <https://rural-cluster.org>

Aarhus Centre, Naryn Kyrgyzstan

The Aarhus Centre in Naryn opened in 2019 and is hosted by the MSRI. The Centre mainly deals with environmental legislation and access to justice in environmental matters, youth empowerment, public awareness, and sustainable development. The main goal of the Aarhus Centre in Naryn is to promote the implementation of the Aarhus Convention at the local level. In particular, the Centre’s main activities during 2020 included: (1) environmental legislation: development of publications on the legislation of the Kyrgyz Republic in environmental

protection; analysis of court cases related to the Aarhus Convention in judicial, executive, and supervisory practices; (2) youth empowerment; (3) public awareness; (4) sustainable development: conducting training seminars, educational conferences, and thematic trainings on environmental protection; and (5) access to justice in environmental matters by raising awareness among the general public about environmental rights to support effective participation in environmental and sustainable development dialogs.



Photo: MSRI UCA

MSRI hosted events and educational activities in 2020

“The Art of Neighborhoods: Border Dynamics, Natural Resources, and Mobility in Central Asia” Conference

Bishkek, Kyrgyzstan, 5 February 2020

In February 2020, a [regional conference](#) was organised by MSRI on “The Art of Neighborhoods: Border Dynamics, Natural Resources, and Mobility in Central Asia.” The event attracted more than 100 leading experts from state and international organisations, research centres, and academic institutes, who shared experiences from Central Asia, Great Britain, Germany, the Caucasus, and China. Topics discussed included cooperation practices in the region; how systems of cross-border management of natural resources can be adapted to emerging crises; and how dynamics of the economy and water cooperation can lead to sustainable use of natural transborder resources.

Keynote speakers at the conference included researchers from the University of Oxford (UK), Ruhr-Universität and Eberswalde University for Sustainable



Photo: MSRI UCA

Development (Germany), “Bilim Karvoni” non-governmental Research and Education Institution (Uzbekistan), Central Asia Regional Economic Cooperation Institute (China), and UCA’s Institute of Public Policy and Administration. The conference was organised in the framework of the “Improving Stability and Better Natural Resource Management in Kyrgyzstan and Tajikistan” project implemented by MSRI and funded by the Government of the United Kingdom (UKAid).

“GEF Country Program Strategy Planning Workshop”

Bishkek, Kyrgyzstan, 10 March 2020



Photo: Alma Uzbekova

MSRI [organized a workshop](#) in March 2020 in Bishkek to identify priority development areas in Kyrgyzstan related to the environment. The event attracted more than 40 representatives from the State Environment Protection bodies, NGOs, and academia. Participants discussed current issues including natural resource management, species and environmental conservation, transboundary water management, land degradation, chemical pollution, and alternative incomes for local populations. They also mapped out current projects in Kyrgyzstan to find synergies among stakeholders with a focus on avoiding project duplication and achieving greater impacts.

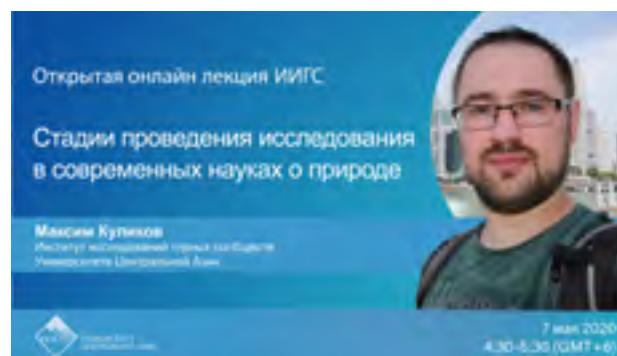
Undergraduate course at UCA, Khorog, Tajikistan



In support of the Earth and Environmental Sciences (EES) Department of UCA, Roy Sidle, MSRI Director and Ben Jarihani, Associate Director have been teaching courses on Hydrology and Hydrogeology, Natural Hazards, Introduction to Remote Sensing and GIS, Advanced Remote Sensing and GIS, and Science Complexity and Impacts of Climate Change to undergraduate students at UCA. They have also been actively advancing the EES program curriculum. Moreover, in Summer 2020, MSRI hosted nine students of UCA's Earth and Environmental Sciences program as interns at the Khorog campus through the co-operative education program. Students received an opportunity to expand their knowledge and work on two small projects in selected topics related to MSRI's activities.

Online Open lecture “Research stages in modern natural sciences”

7 May 2020



This lecture by Dr. Maksim Kulikov was devoted to the organization and implementation of environmental research. The topics included fundraising, methodological planning, field trip planning (including ensuring compatibility of the field data collection and statistical analysis methods), and how to develop articles for a peer-reviewed journals.

Watch [full recording of the lecture](#) on UCA's Youtube.

Online launch of the first Spanish book related to landslides in South America, *Movimientos en Masa* (Mass Movements), edited by Maria Casamitjana Causa and Roy C. Sidle

Professor Sidle co-edited and contributed to three of the 14 chapters in this book on mass movements focusing on Latin America. This first comprehensive landslide text published in Spanish covers landslide classification, soil physical and hydrological properties affecting landslides, remediation practices, modelling landslide hydrology, hydrogeomorphic processes affecting landslide initiation, effects of land use on landslide initiation, landslide susceptibility studies, and legal aspects of landslides in various regions of the world. In addition to the co-editors from Colombia and Tajikistan, other contributors are from Russia, Brazil, Spain, Taiwan, Venezuela, USA, Korea, Italy, and Australia, with a forward by Dr. Hirotaka Ochiai from Japan.



While the book was published in 2019, the official release of the book was announced at a book fair in Medellin, Columbia in October 2020.

The introduction is at: https://youtu.be/pLfIB-I_cba



Photo: MSRI UCA

Conferences & Workshops Attended by MSRI Staff in 2020

Presentation on *The Role of History Textbooks in Social Cohesion on the Kyrgyz-Tajik Border* at the Conference on “Education for Peacebuilding and Social Cohesion”, AKF Kyrgyzstan, Bishkek, Kyrgyzstan, 23 January 2020.

Invited participant in the LEWS2020 workshop on *Regional Landslide Early Warning Systems*, Perugia, Italy, 28-30 January 2020.

Presentation on *The Fergana Valley Security Dilemma from a Community Perspective* at the Conference on “Rethinking the neighborhoods in Ferghana Valley”, MSRI, Bishkek, Kyrgyzstan, 5 – 6 February 2020.

Presentation on *Vegetation trend analysis in Tajikistan and Kyrgyzstan borderlands* at the [Conference](#) on “Rethinking the neighborhoods in Ferghana Valley”, MSRI, Bishkek, Kyrgyzstan, 5 – 6 February 2020.

Presentation on “Detect groundwater storage in an island watershed by GRACE gravimetry” at the Online European Geoscience Union General

Assembly, 4-8 May 2020.

Presentation on *Research staged in modern nature science* at the [UCA Online Public Lecture](#), 7 May 2020.

Online Asia Oceania Geosciences Union 17th Annual Meeting, 28 June – 4 July 2020

Presentation on *Rethinking Neighborhood: Transforming the Border Territories of the Fergana Valley* at the [Online Round table](#) “Borders of States and Borders of Living Space: Towards the Issue of Border Problems in Central Asia”, IWPR, 23 July 2020.

Third Central Asia Climate Change [Online Conference](#) (CACCC-2020), Regional Environmental Centre for Central Asia, 19 - 23 October 2020.

ELSOFP CA Project Online Trade-Info Platform Launching [Online Meeting](#), Kyrgyz Association of forest and land users (KAFLU), 4 November 2020.

«Silk Road of Knowledge» [Online conference](#), Kazakh-German University, 24 - 27 November 2020.

Publications in 2020

MSRI Briefs



Maksim Kulikov. [“What is the Impact of Climate on Local Communities in the Isfara River Catchment?”](#) MSRI Brief March 2020: 1-4.



Asel Murzakulova and Roy C. Sidle. [“Rethinking the Nexus of Climate Change, Development and Discourse of Danger in Central Asia.”](#) MSRI Brief September 2020: 1-4.

MSRI Research Reports



Azamat Azarov, Zbynek Polesny, Vladimir Verner and Dietrich Darr [“Characteristics and Profitability of Livestock-based Farming Systems in At-Bashy, Naryn Oblast.”](#) Research Report #6. 2020.



Asel Murzakulova. [“Rural Migration in Kyrgyzstan: Drivers, Impact and Governance.”](#) Research Report #7. 2020.



Maksim Kulikov, Gulbara Omorova and Evgenii Shibkov. [“What is the Impact of Climate on Local Communities in the Isfara River Catchment?”](#) Research Report #5. 2020.



Roy C. Sidle. [“Dark Clouds over the Silk Road: Challenges Facing Mountain Environments in Central Asia.”](#) Research Report #8. 2020.

Refereed Journal Publications

Arata, Yohei, et al. “Topographic Features and Stratified Soil Characteristics of a Hillslope with Fissures Formed by the 2016 Kumamoto Earthquake.” *Geoderma*, vol. 376, 2020, p. 114547. Crossref, doi:10.1016/j.geoderma.2020.114547.

Bradshaw, J. Kenneth, et al. “Sediment and Fecal Indicator Bacteria Loading in a Mixed Land Use Watershed: Contributions from Suspended Sediment and Bedload Transport.” *Journal of Environmental Quality*, 2021. Crossref, doi:10.1002/jeq2.20166.

Fabinyi, Michael, et al. “Changing Inland Waterbody Livelihoods in Issyk-Kul, Kyrgyzstan.” *Journal of Marine and Island Cultures*, vol. 9, no. 1, 2020. Crossref, doi:10.21463/jmic.2020.09.1.02.

Ghorbanzadeh, Omid, et al. “Gully Erosion Susceptibility Mapping (GESM) Using Machine Learning Methods Optimized by the Multi-collinearity Analysis and K-Fold Cross-Validation.” *Geomatics, Natural Hazards and Risk*, vol. 11, no. 1, 2020, pp. 1653–78. Crossref, doi:10.1080/19475705.2020.1810138.

Koci, Jack, et al. “Effect of Reduced Grazing Pressure on Sediment and Nutrient Yields in Savanna Rangeland Streams Draining to the Great Barrier Reef.” *Journal of Hydrology*, vol. 582, 2020, 124520. Crossref, doi:10.1016/j.jhydrol.2019.124520.

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Koyanagi, Kenta, et al. "Characteristics of Landslides in Forests and Grasslands Triggered by the 2016 Kumamoto Earthquake." *Earth Surface Processes and Landforms*, vol. 45, no. 4, 2020, pp. 893–904. Crossref, doi:10.1002/esp.4781.

Kulikov, Maksim, et al. "Modelling Soil Erodibility in Mountain Rangelands of Southern Kyrgyzstan." *Pedosphere*, vol. 30, no. 4, 2020, pp. 443–56, doi:10.1016/S1002-0160(17)60402-8.

Mardani, Neda, et al. "Improving the Accuracy of Hydrodynamic Model Predictions Using Lagrangian Calibration." *Water*, vol. 12, no. 2, 2020, 575. Crossref, doi:10.3390/w12020575.

Moresi, Federico Valerio, et al. "Mapping Landslide Prediction through a GIS-Based Model: A Case Study in a Catchment in Southern Italy." *Geosciences*, vol. 10, no. 8, 2020, 309. Crossref, doi:10.3390/geosciences10080309.

Pearce, Tristan, et al. "'Even If It Doesn't Come, You Should Be Prepared': Natural Hazard Perception, Remoteness, and Implications for Disaster Risk Reduction in Rural Fiji." *International Journal of Disaster Risk Reduction*, vol. 48, 2020, 101591. Crossref, doi:10.1016/j.ijdr.2020.101591.

Pertuz-Paz, Aleen, et al. "Linking Soil Hydrology and Creep: A Northern Andes Case." *Geosciences*, vol. 10, no. 11, 2020, 472. Crossref, doi:10.3390/geosciences10110472.

Reza Eini, Mohammad, et al. "Development of Alternative SWAT-Based Models for Simulating Water Budget Components and Streamflow for a Karstic-Influenced Watershed." *CATENA*, vol. 195, 2020, 104801. Crossref, doi:10.1016/j.catena.2020.104801.

Shigaeva, Jyldyz, and Dietrich Darr. "On the Socio-Economic Importance of Natural and Planted Walnut (*Juglans Regia* L.) Forests in the Silk Road Countries: A Systematic Review." *Forest Policy and Economics*, vol. 118, 2020, 102233. Crossref, doi:10.1016/j.forpol.2020.102233.

Sidle, Roy C. "Dark Clouds over the Silk Road: Challenges Facing Mountain Environments in Central Asia." *Sustainability*, vol. 12, no. 22, 2020, 9467. Crossref, doi:10.3390/su12229467.

Tani, Makoto, et al. "Characterization of Vertical Unsaturated Flow Reveals Why Storm Runoff Responses Can Be Simulated by Simple Runoff-Storage Relationship Models." *Journal of Hydrology*, vol. 588, 2020, p. 124982. Crossref, doi:10.1016/j.jhydrol.2020.124982.

Zhu, Xiai, et al. "Reductions in Water, Soil and Nutrient Losses and Pesticide Pollution in Agroforestry Practices: A Review of Evidence and Processes." *Plant and Soil*, vol. 453, no. 1–2, 2020, pp. 45–86. Crossref, doi:10.1007/s11104-019-04377-3.

Other Publications

Barbosa, Natalie, et al. "CaTeNA – Climatic and Tectonic Natural Hazards in Central Asia Final Virtual Workshop September 24–25 2020 :: GFZpublic." GFZ German Research Centre for Geosciences, 2020, doi.org/10.2312/gfz.catena.2020.

Chung-Chieh, Huang, et al. "[Using GRACE Estimates of Groundwater Storage Changes in the Zhoushui River Alluvial Fan, Taiwan](#)." AGU - AGU Fall Meeting 2020, AGU, 8 Dec. 2020.

Huang, Chung-Chieh, et al. "Detect Groundwater Storage in an Island Watershed by GRACE Gravimetry." EGU General Assembly 2020, 2020. Crossref, doi:10.5194/egusphere-egu2020-1827.

Khanarmuei, Mohammadreza, et al. "Impact of Sensor Location on Assimilated Hydrodynamic Model Performance." *Proceedings of the 22nd Australasian Fluid Mechanics Conference AFMC2020*, 2020. Crossref, doi:10.14264/739522a.

Kuznetsova, Irina, et al. "[Migration and COVID-19: Challenges and Policy Responses in Kyrgyzstan](#)." CAP Paper No. 247, Central Asia Program, 3 Dec. 2020.

M.C. Causa and R.C. Sidle (editors). 2019. *Movimientos en Masa (Mass Movements)*. Fondo Editorial EIA, Colección Recursos de Aprendizaje. Envigado, Colombia. 385 p. (launched in 2020)

Mardani, Neda, et al. "A Numerical Investigation of Dynamics of a Shallow Intermittently Closed and Open Lake and Lagoon (ICOLL)." *Proceedings of the 22nd Australasian Fluid Mechanics Conference AFMC2020*, 2020. Crossref, doi:10.14264/7847a45.

Nicol, A., et al. "Between a Rock and a Hard Place: Early Experience of Migration Challenges under the Covid-19 Pandemic." *IWMI Working Paper 195*, 2020, pp. 1–22. Crossref, doi:10.5337/2020.216.

Ritonga, Rasis Putra, et al. "[Effect of Forest Management on Earthquake-Induced Landslide by the 2018 Mw6.7 Eastern Iburu Earthquake, Hokkaido.](#)" *AGU Fall Meeting 2020*, AGU, 14 Dec. 2020.

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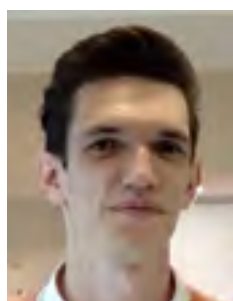
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