



Food and Agriculture  
Organization of the  
United Nations

Comprehensive analysis of the  
**disaster risk reduction system**  
for the agricultural sector in Kyrgyzstan



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Required citation:

FAO. 2022. *Comprehensive analysis of the disaster risk reduction system for the agricultural sector in Kyrgyzstan*. Budapest.  
<https://doi.org/10.4060/cb8418en>

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ISBN 978-92-5-135683-8

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# Acknowledgements

Under the technical guidance of Daniela Mangione, Resilience Focal Point, and Cheng Fang, Economist, of the Regional Office for Europe and Central Asia (REU) of the Food and Agriculture Organization of the United Nations (FAO), this document was developed by Enver Suerkulov, with the support of Kaisu-Leena Rajala, Anastasia Kvasha, and Tamara van 't Wout. The report was reviewed by Makhmud Shaumarov, CACILM2, and by Matraim Jusupov, Jyldyz Toktomametova, Cholpon Alibakieva, Marlen Tynaliev, Gulmira Urmanbetova, Omurbek Mambetov and Marina Kichinebatyrova, FAO Country Office in Kyrgyzstan. Valuable review, comments and contributions were received from the following colleagues from the FAO headquarters and regional office: Eran Raizman, Marion Chiris, Keigo Obara, Bradley Paterson, Viktorya Ayvazyan, Jorge Alvar-Beltran, Olga Buto, Ana Heureux, Muratbek Koshoev, Shiroma Sathyapala, Fazil Dusunceli, and Peter Pechacek.

Financial support was provided by the Global Environment Facility-financed project, Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Systems in Central Asia and Turkey (CACILM2).

# Abbreviations and acronyms

CAIAG	Central Asian Institute for Applied Geosciences
CCCCI	Coordination Commission on Climate Change Issues
CESDRR	Center for Emergency Situations and Disaster Risk Reduction
CMC	Crisis Management Centre
CFSN	Council on Food Security and Nutrition of the Kyrgyz Republic
CliWare	Integrated Data Management System
COSMO	Consortium for Small-scale Modeling
DA	Department of Agrometeorology of Kyrgyzhydromet
DMF	Department of meteorological forecasting of Kyrgyzhydromet
DMFES	Department of Monitoring and Forecasting of Emergency Situations
DRR	Disaster risk reduction
EAEU	Eurasian Economic Union
ECMWF	European Centre for Medium-Range Weather Forecasts
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EWS	Early warning systems
FAO	Food and Agriculture Organization of the United Nations
FSNP	Food Security and Nutrition Program for 2019-2023
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GIEWS	FAO global information and early warning system
GIS	Geographical information systems
GIZ	German Agency for International Cooperation
GKR	Government of the Kyrgyz Republic
HRPT	High Resolution Picture Transmission
IB NAS KR	Institute of Biology of the NAS KR
ICCP	Interdepartmental Commission for Civil Protection
IFAD	International Fund for Agricultural Development
IG NAS KR	Institute of Geology of the NAS KR
IS of NAS KR	Institute of Seismology of the NAS KR
ISDR	International Strategy for Disaster Reduction
IWPH NAS of KR	Institute of Water Problems and Hydropower of the NAS KR
JMA	Japan Meteorological Agency
KGS	Kyrgyzstani Som
KNAU	Kyrgyz National Agrarian University
KR	Kyrgyz Republic
KRSU	Kyrgyz-Russian Slavic University
Kyrgyzgiprozem	State Design Institute for Land Management

Kyrgyzhydromet	Agency on Hydrometeorology under the State Committee on Ecology and Climate
MAFILR	Ministry of Agriculture, Food Industry and Land Reclamation (before 2021)
MAWRRD	Ministry of Agriculture, Water Resources and Regional Development (since 2021)
MES	Ministry of Emergency Situations
NAS KR	National Academy of Sciences of the Kyrgyz Republic
NGO	Non-governmental organization
NSC	National Statistical Committee
PDNA	Post-disaster needs assessment
SAEPF	State Agency for Environment Protection and Forestry (before 2021)
SARD	State Agency for Regional Development
SCEC	State Committee on Ecology and Climate (since 2021)
SCIESU	State Committee for Industry, Energy and Subsoil Use
SCPS	State Civil Protection System
SCSIA	State-wide comprehensive system of informing and alert the public
SDGs	Sustainable Development Goals
SIVPS	State Inspectorate for Veterinary and Phytosanitary Security under the GKR
SOP	Standard operating procedures
SWRA	State Water Resources Agency under the Ministry of Agriculture, Water Resources and Regional Development
UIMS	Unified Information Management System for Forecasting, Early Warning, Prevention and Elimination of Consequences of Emergency and Crisis Situations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USIMF	Unified System for Integrated Monitoring and Forecasting of Emergencies
WFP	World Food Programme



# Executive summary

**Natural and biological hazards.** Kyrgyzstan is a mountainous country with a sharp continental arid climate. The features of the relief, geological structure and climatic characteristics determine the vulnerability of its territory to more than 20 types of natural hazard, which directly and indirectly affect the development of agriculture. Among the main natural and biological hazards that directly affect agriculture in Kyrgyzstan are drought, frosts, rain showers, hail, animal and plant diseases, spread of agricultural pests, and increased wind load related to hail, rain, and sand exposure. A separate problem is the degradation of land and pasture vegetation, particularly through soil erosion (desertification process). Every year, natural and biological emergencies cause certain damage to the economy of the country and jeopardise the country's food security. Each agricultural hazard is influenced by various factors, but the most relevant involve the processes of climate change and human activities. Climate change in Kyrgyzstan is manifested in rising temperatures (if current trends continue, temperatures could rise by more than 4 °C by 2100) and some changes in precipitation, which undoubtedly affects the frequency and magnitude of agricultural hazards. Climate change is expected to affect adversely the quality of agricultural land, crop production, and the country's food security. It is anticipated that the fertility of arable lands will decrease and that deserts and semi-deserts will expand. The annual damage to agriculture from climate-dependent extreme events by 2100 may amount to more than USD 48.7 million (GKR, 2017).

**Agriculture and food security.** Over recent years, there has been a decrease in the share of agriculture in the country's GDP – the sector now accounts only for around 12 percent (NSC, 2019c). Crop yields are often unstable and vary from year to year, since agriculture is dependent on climate. Kyrgyzstan could justifiably satisfy its domestic food consumption needs, but these goals have not been achieved yet. Over the past ten years, the proportion of the population living in extreme poverty has decreased quite significantly, but approximately 1.6 million people (25.6 percent of the population) still live below the poverty line (USD 1.30 per day), 72 percent of whom reside in rural areas. Expenditures on food make up a significant part of household expenses in all regions of the country (WFP, 2018). Despite the steady growth in the production of basic agricultural products, commodity circulation is not growing as much, which indicates market fluctuations and inflation. The development of the agrifood sector impedes a number of shortcomings in the operation of the market mechanism. These include, in particular, ineffective functioning of resource markets, lack of provision of services, and high transaction costs. Information asymmetry also leads to a weakening of ties between small farms and small enterprises. Government intervention in these areas is needed to improve the access of smallholders and agrifood industries to markets, and create additional opportunities for them to benefit and improve their livelihoods (World Bank, 2018a).

**Institutional structure and framework for disaster risk reduction (DRR) in agriculture.** Kyrgyzstan is party to several international treaties and conventions on disaster risk management, climate change, and food security, such as the United Nations Framework Convention on Climate Change (UNFCCC), the Sendai Framework for DRR, and the Paris Agreement. In addition, the Sustainable Development Goals (SDG) are followed when developing national policies and strategies. Strategic goals, objectives and actions in disaster risk management, adaptation to climate change, and ensuring food security, are defined in the National Development Strategy of the Kyrgyz Republic for 2018–2040 and the Development Programme of the Kyrgyz Republic for the period 2018–2022. A systematic definition of the problems of disaster risk management in the country and the main directions/actions to address them are set out in the Concept of Comprehensive Protection of the Population and Territories of the Kyrgyz Republic from Emergency Situations for 2018–2030. This document is based on the Sendai Framework. In these key disaster risk management programmes, agricultural risks are covered only partially, mainly in the area of animal and plant diseases and pests. More attention to agricultural disaster risks is given in the Programme on Adaptation of Agriculture and Water Management to Climate Change for 2016–2020, the purpose of which is to determine the vulnerability of agriculture and water management and the development of measures to adapt agriculture and water management to climate change.

In Kyrgyzstan, the State Civil Protection System (SCPS) has been formed, the elements of which are governing bodies, agencies of state bodies, local self-government bodies, public associations, and voluntary organizations. The SCPS protects the population and the territory of the country in emergency situations during peace time and war. The Ministry of Emergency Situations (MES) is the authorized state executive authority, implementing a unified state policy in civil protection, fire, radiation safety, safety of people at water facilities, and hydrometeorology. However, MES covers only biological hazards in the context of various agricultural disasters. State monitoring and forecasting of the appearance and spread of quarantine and regulated non-quarantine pests, as well as veterinary control, are among the functions of the Ministry of Agriculture, Water Resources and Regional Development (MAWRRD) related to DRR in agriculture. However, the remaining agricultural disaster risks are not the subject of the ministry's work. Thus, special attention is not paid to the reduction of agricultural disaster risks in the country and, accordingly, there is no agency and holistic policy responsible for the comprehensive reduction of disaster risks in agriculture related to climate change.

Kyrgyzstan has a strong and effective climate change risk management framework in the form of the Coordinating Council on the development of "green" economy and climate change chaired by the prime minister (until 2020 such activities were carried out by the Coordination Commission on Climate Change Issues (CCCCI), and the National Platform for DRR, which aims to bring together and coordinate the efforts of all participants in governance disaster risk in the country. Highlighting the issues of agricultural disaster risks in the priorities of these structures could significantly strengthen the intensification of work in this direction. Still, there is a clear lack of coordination between sectors, while cross-sectoral issues are not recognised in policy or strategic sectoral planning. Coordination mechanisms between agency officials currently do not support the integration of agricultural DRR practices and approaches.

**Early warning systems (EWS).** The Department of Monitoring and Forecasting of Emergencies (within MES) is the key national disaster risk management institute involved in the monitoring and forecasting of dangerous endogenous and exogenous natural processes that threaten not only urbanized areas, but also rural communities and agricultural infrastructure. In order to create a comprehensive functional automated EWS in the country, the Unified Information Management System for Forecasting, Early Warning, Prevention and Elimination of Consequences of Emergency and Crisis Situations was established. It consists of four main components: crisis management centres; statewide comprehensive system of informing and alert the public; unified duty dispatch service 112; and a unified system for integrated monitoring and forecasting of emergencies. Monitoring and analysis of the epizootic situation is carried out by the MAWRRD and the State Inspectorate for Veterinary and Phytosanitary Security. Monitoring and assessment of agricultural land is carried out by the structural units of MAWRRD, the State Design Institute for Land Management (*Kyrgyzgiprozem*), and the Department of Pasture, Livestock and Fisheries. The existing system of monitoring and prediction of disaster risks is characterised by the absence of a fully functional automated monitoring system of natural and man-made emergencies; unified system of integrated monitoring and forecasting; regulatory framework with a clear distribution of powers, duties, tasks and functions between involved stakeholders; regulations for information exchange between ministries, departments and scientific centres.

**Agrometeorological services.** In Kyrgyzstan, a unified state policy in the field of hydrometeorological safety is implemented by the Agency for Hydrometeorology (*Kyrgyzhydromet*) under the State Committee on Ecology and Climate of the Kyrgyz Republic (SCEC). Agrometeorological observations are carried out at 20 meteorological stations and ten agrometeorological posts. It is important to take into account that *Kyrgyzhydromet* is designed to serve equally both the civil protection sector and the agriculture and water management sectors. In this regard, it is very important to improve the mechanism of interaction between *Kyrgyzhydromet* and MAWRRD, the SCEC, and the State Agency for Regional Development (SARD) on DRR in agriculture and the environment. Agrometeorological equipment and instruments are physically outdated, often cannot be repaired, and require urgent replacement. Weather forecasts, storm warnings and agrometeorological bulletins are available on the *Kyrgyzhydromet* website. However, specialised information (detailed meteorological, hydrological, agrometeorological information on background concentrations of pollutants in the atmosphere) is provided on a contractual basis for a fee. The potential of *Kyrgyzhydromet* services has been significantly enhanced recently with the help of international assistance, both in technical and methodological terms. Meteorologists have received computer equipment with appropriate software, and a digital agrometeorological and agricultural statistical database has been developed, which is updated through existing and new weather stations installed in some regions. However, the agrometeorological service has not been given enough attention in terms of capacity development (technical and personnel), and it is in urgent need of such support.

**Disaster risk reduction in agriculture.** In Kyrgyzstan, assessments of the risks of agricultural disasters (apart from the fisheries sector) are not done by any organization, although this should be the responsibility of the Ministry of Agriculture. This is primarily related to the low level of expertise among ministry employees, as well as to the lack of necessary data and adapted methods. The Emergency Response Plan of the Kyrgyz Republic was developed and adopted in 2018 to coordinate the actions of disaster management actors at all levels, with the identification of key emergency-response procedures. This document summarises response measures but does not identify a timeline for their implementation. In relation to the agricultural sector, the plan covers only epizootic hazards. Overall, sectoral preparedness and response plans, including the agricultural sector, have not been developed yet. The national system of disaster risk management in agriculture is characterised by the absence of sectoral and territorial DRR plans (especially for *aiyl aimaks*);<sup>1</sup> disaster risk analysis and assessment regulations at all levels; sectoral methodologies for assessing damage and emergency needs; new sector-specific methodologies for assessing damage in agriculture and post-disaster needs, despite the fact that FAO has developed a methodology for assessing damage in the sector as a whole; standard operating procedures (SOPs) for the response and early recovery phases; the institutional and legal framework for coordinating long-term recovery; disaster insurance policies.

The National Statistical Committee (NSC) assesses annually losses in agriculture based on the collected data on the destroyed crops and mortality of livestock and poultry; however, no such data is collected for fisheries. Currently, implemented data collection is mostly sufficient for calculations under the FAO's Methodology for Damage and Loss Assessment in Agriculture. Kyrgyzstan recognised the FAO methodology as an effective tool in achieving the country's needs, and MAWRRD will work towards adapting, adopting, implementing and incorporating it in the upcoming agricultural insurance programme and activities of the ministry. Some of the challenges in relation to damage and loss assessment include the lack of cooperation between the district departments of MES with the territorial bodies of MAWRRD and the NSC; rather short-term storage of information for the forestry sector; a limited number of disaster impact assessment indicators and corresponding underestimation of the total losses for the sector; a lack of the aggregated database. While the government currently provides farmers with the possibility to insure their houses, there is a clear need to focus on securing affordable insurance for livestock and crops. There is an active Law on the features of insurance in crop production (No. 31, 2009). However, in the existing environment, it does not actually work – in recent years, not a single case of contracting and payment of the insured amount was recorded in the crop and livestock sectors for damage caused by natural and biological disasters. It is necessary to create conditions for such insurance to function.

**Programmes and projects related to DRR.** Various United Nations agencies, including FAO, World Food Programme (WFP), United Nations Development Programme (UNDP), as well as other international organizations such as GIZ (the German Agency for International Cooperation), together with key national institutions, are implementing a number of programmes and projects related to DRR, EWS, and agrometeorology services, including adaptation to climate change. The SCEC, MAWRRD, MES, SARD, the State Inspectorate for Veterinary and Phytosanitary Security (SIVPS) and other national disaster risk management structures need to conduct a joint study on the analysis and evaluation of agricultural and food-security sector projects of international organizations in the field of DRR and climate change. This analysis and assessment will provide a good result in terms of developing measures and mechanisms for the slow-onset disasters and threats associated with climate change.

**Conclusions and recommendations.** Kyrgyzstan's national DRR legislation clearly does recognise and categorise various natural hazards, including those affecting the agricultural sector. However, the system to address and reduce those risks has not been fully developed yet. The main coordinating entity responsible for DRR activities across different sectors and hydrometeorology in the country is MES, which is responsible for the implementation of monitoring and forecasting by responsible organizations, as well as for control of biological hazards. At the same time, the Ministry of Agriculture is responsible for monitoring of pests and veterinary control. However, there is no agency responsible for comprehensive DRR in agriculture. The country's system for risk assessment and early warnings in agriculture is not very well developed. It partially addresses epiphytotics and epizootics; however, it does not cover other hazards such as drought and desertification. No response system to agricultural disasters exists in the country – affected entities do not know how to act, no response measures are defined, and there are no SOPs for such situations. Agrometeorological services have not yet been

<sup>1</sup>Rural self-governing bodies that include one or more villages.

given enough attention in terms of capacity development (technical and personnel), and there is an urgent need for such support. At the same time, information support for farmers is developed quite poorly. Kyrgyzstan does not have a comprehensive mechanism for disaster risk assessment in the agricultural sector, although this should be the responsibility of the Ministry of Agriculture. There is no sectoral DRR plan, and emergency preparedness and response plan, in place that would cover all agricultural disasters.

Thus, suggested recommendations covering various problematic aspects include:

#### **Policy recommendations:**

- Mainstream DRR into the country's agricultural plans, policies, and strategies.
- Introduce appropriate amendments to the Law on Local Self-Government and Local State Administration, regarding actions related to agricultural disaster risk management.
- Develop state programmes and plans for agrometeorology to strengthen agrometeorological services.
- Approve the methodological foundations of disaster risk management and the conceptual framework in sectoral programmes and plans for DRR in agriculture and water management.

#### **Recommendations for improvement of institutional framework and coordination mechanisms:**

- Expand the practice of creating local institutions responsible for managing natural resources as well as the practice of creating rural rescue teams. In addition, expand the responsibilities of the rural rescue teams in addressing agricultural disasters.
- Determine the interaction of the departments and ministries involved in the creation of electronic databases for assessing agricultural risks, their exchange and access.
- Facilitate the promotion of "green" environmentally friendly products and technologies that help reduce risks, exchange of experiences, information and knowledge in this field in relation to agricultural emergency management.
- Develop a registry of disaster risks in the agricultural and water management sectors, taking into account climate change and the direct impact on food security.

#### **Recommendations for improvement of early warning systems:**

- Improve country's EWS to provide timely information about agricultural hazards and their expected effects on agriculture.
- Develop and implement within the Unified System an industry-wide system for early warning of emergencies in the agricultural sector. Identify a responsible line agency (such as MAWRRD).
- Provide training for staff to improve the modelling and analytical capabilities needed to inform decisions and decision-making processes.
- Increase the availability of knowledge on prevention, response to agricultural disasters, and risk insurance for farmers and other agricultural producers through capacity-development activities for the specialists from district agrarian development directorates.
- Develop and implement information dissemination channels accessible for rural agricultural producers to deliver information on EWS to consumers (including market information systems).
- Improve communication between aiyl okmotus and farmers on one side,<sup>2</sup> and relevant institutions on the other, through enhancement of feedback mechanisms and participatory approaches.

#### **Recommendations for improvement of agrometeorology services:**

- Expand the network of agrometeorological observations involving the private sector and upgrade agrometeorological equipment and instruments.
- Develop a course on agrometeorology and management of agricultural emergencies and include it in the training programme for agricultural specialists at the Agrarian University.
- Develop and disseminate information materials for farmers.
- Clearly define responsibilities in the production and delivery of climate services.
- Develop and implement national strategies for digital agriculture.

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<sup>2</sup>Executive authorities of aiyl aimaks.

## **Recommendations for improvement of disaster risk reduction system:**

- Adapt international methodologies for assessing agricultural disaster risk and apply them at the national, regional and local levels. Initiate implementation of the FAO capacity-development project on DRR and preparedness in the agricultural sector.
- Develop and adopt risk assessment indicators for agriculture and conduct regular monitoring.
- Regularly develop agricultural disaster risk assessment reports, recommendations, and actions taken.
- Keep track of the implementation of all international projects in the field of DRR in the agricultural sector, and adaptation to climate change.
- Develop effective measures and mechanisms to address the slow-onset disasters and threats associated with climate change.
- Develop and approve adaptation and mitigation plans for agricultural disaster risks, and preparedness and response plans at the national, regional, and local levels.
- Use the experience of international organizations such as UNDP, FAO, the Agency for Technical Cooperation and Development (ACTED), and so on, in assessing risks and developing plans at the local level. Monitor and evaluate the implementation of these plans.
- Develop and disseminate technologies that facilitate monitoring, early warning, and reducing the risks of agricultural disasters. Use traditional knowledge as a basis for documentation and dissemination of easy-to-use technologies among farmers. Establish a mechanism for the transfer of environmentally sound technologies to reduce disaster risks in agriculture.
- Develop and adapt a methodology for calculating the benefits and costs of applying preventive measures to manage agricultural disaster risk, to make economic benefits more visible and clear.
- Complete the review, adaptation and implementation of the FAO's assessment methodology for damage and loss from disasters caused by natural hazards in agriculture and forestry. Consider the possibility of capacity-development activities for employees of the Ministry of Agriculture.
- Develop a software for entering and processing information on damage and loss in agriculture in offline/online modes in order to create a statistical database.
- Conduct training for employees of the NSC, MES, and local governments to build their capacities in collection and exchange of data on damage and loss in agriculture.
- Create conditions for proper functioning of the existing Law on the Features of Insurance in Crop Production. Consider the issue of insurance in animal husbandry against natural hazards.

# Introduction

The Europe and Central Asia (ECA) region is prone to various natural hazards, including flooding, drought, hail, avalanches, landslides, storms, and so on. With climate change, these extreme weather events, and temperature and precipitation changes, are expected to increase in frequency and severity and threaten to reduce yields and productivity in crops, livestock, fisheries and forestry in many areas of the region, as well as impact food security, nutrition and ecosystem services. The agricultural sector, and in particular smallholders, herders, fishers and foresters, are particularly vulnerable to the adverse impacts of climate change, as the majority of these smallholder producers are dependent on the sector and its activities for their food and livelihoods.

This Comprehensive Analysis of the Disaster Risk Reduction System for the Agricultural Sector in Kyrgyzstan is part of a series of country baseline studies conducted by FAO's Regional Office for Europe and Central Asia (REU). The other countries included in the series are Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Republic of Moldova, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Similar reports analysing the DRR and management system for the agricultural sector in Western Balkan countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia) were completed in 2018.<sup>3</sup>

The country baseline studies review the current status of DRR, EWS and agrometeorology services in the agricultural sector – including legislation, policies, capacities, and services related to the DRR system – and assess the gaps and needs in order to improve and strengthen these areas. The results of the country studies will be used as technical background reports for the development and implementation of capacity-development initiatives.

This report was developed based on primary (interviews) as well as secondary (literature review) data sources. Information on gaps, challenges, constraints, and opportunities was collected through semi-structured interviews with relevant national officials and experts, following the provided guidelines and the developed questionnaire. Questions were largely based on the questionnaire of the Capacity for Disaster Reduction Initiative (CADRI)<sup>4</sup> Capacity Assessment and Planning Tool for Disaster Risk Management for Food Security and Agriculture and for Climate Services. The interviews took place in April 2019.

This study was conducted under the REU Regional Initiative 3 that focuses on 'Sustainable Natural Resources management in a Changing Climate'. Financial support was provided by the Global Environment Facility (GEF) through the Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Systems in Central Asia and Turkey (CACILM2) project.

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<sup>3</sup>The Western Balkan studies are available at <https://www.fao.org/europe/resources/disaster-risk-reduction-and-management/en/#c589778>

<sup>4</sup>CADRI brings together six United Nations organizations – FAO, OCHA, UNDP, UNICEF, WFP, and WHO. This UN-led interagency initiative delivers customised capacity-development support in DRR.

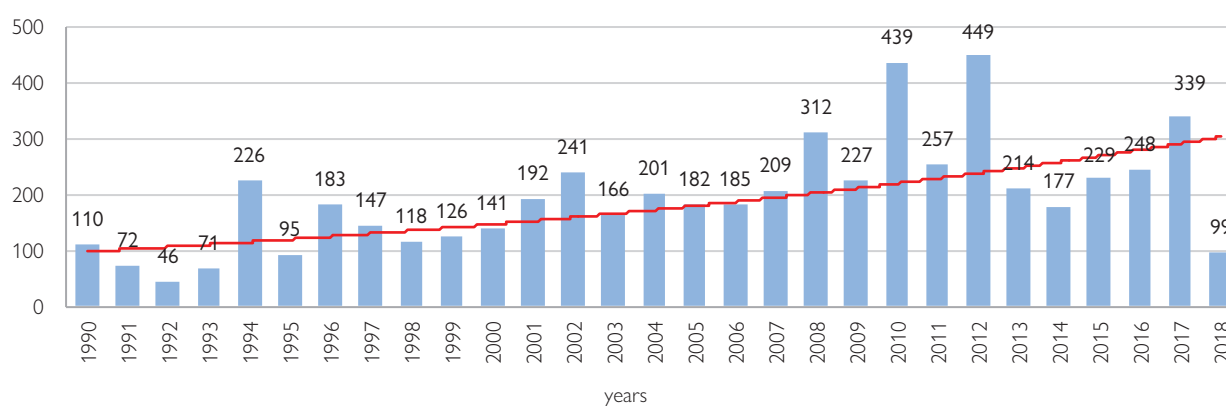
# Country background

# Natural hazards profile

## Natural hazards

Due to its geographical location in a seismically active mountain region, with significant elevation disparities and a continental climate, Kyrgyzstan is highly vulnerable and prone to many natural and biological hazards that adversely affect its agricultural sector and food security (MES, 2011a). The total number of emergencies that happened over the past 28 years is 5 701, of which 2 936 emergencies took place in the past ten years (one and a half times more than in the 1993–2008 period), as shown in Figure 1 (MES, 2018a). In 2018, some of the most common types of disasters were: debris flow and flooding (more than one third of all events), avalanches, man-made accidents, meteorological hazards, and earthquakes (MES, 2018a). Over the 2000–2018 period, the most number of emergencies and the highest number of fatalities were recorded in the Jalal-Abad, Osh, and Chuy regions.

Figure 1. Total number of emergencies per year, 1990–2018



Source: MES, 2018a.

It is estimated that annually, three to four disasters caused by extreme meteorological events occur in Kyrgyzstan. Due to effects of climate change, it is expected that the share of hydrometeorological hazards such as frost, drought, extreme heat, heavy precipitation, and strong winds will increase (Ilyasov *et al.*, 2013). This may lead to economic losses, particularly in agriculture through the massive loss of livestock and crops, which will further exacerbate the already difficult situation for farmers – most of whom are subsistence farmers. Approximately one million people (one-quarter of the rural population) live below the poverty line (NSC, 2020a).

**Earthquakes.** Kyrgyzstan is highly prone to earthquakes due to its proximity to the Tien Shan and Pamir mountain ranges. As a result, most of country’s territory is prone to 8-point or 9-point earthquakes on the MSK-64 scale (Shedlock *et al.*, 2000). About 3 000 seismic events are recorded every year, with 10 to 20 earthquakes with a magnitude of more than 5.0 points on the MSK-64 scale recorded as “emergency situations” (NAS KR, 1995; NAS KR, 2011). A high level of vulnerability to earthquakes is typical for rural houses and structures used for the maintenance of livestock, most of which were built in Soviet times or do not comply with the requirements for earthquake-proof constructions (GKR, 2018b). In 2011, the Institute of Seismology of the National Academy of Sciences of the Kyrgyz Republic developed a new Seismic Zonation Map of the territory of Kyrgyzstan and compiled a “list of settlements indicating the initial score of expected earthquakes” (MES, 2015).

**Mountain lake outbursts.** According to the Kyrgyz Integrated Hydrogeological Expedition, 314 mountain lakes are considered hazardous (Erokhin, Chernykh and Yanski, 2008).



**Landslides.** The country is also prone to landslides. It is estimated that there are about 5 000 potentially dangerous landslide areas that pose a real threat to human life and infrastructure. The number of landslides increases annually due to the intensification of modern geodynamic movements, seismicity, rising groundwater levels, anomalous amounts of precipitation, as well as human engineering and economic activities that disturb slope stability in mountainous areas. The total area of land affected by landslide processes is calculated at about 7.5 percent of the country's total territory.

**Mud flows and flooding** happen on average 73 times per year, which is around 29 percent to 30 percent of all disasters occurring per year. Settlements are highly vulnerable to the impact of these hazards as 95 percent of all populated places in the country are located on the banks or river discharge cones of river outflows or temporary watercourses. This leads to transportation routes, farmland, hydro-technical and irrigation facilities being adversely impacted by mud flows and flooding (MES, 2017).

**Heavy rain.** The largest number of days with heavy rain (up to 100 mm per hour) happens between April and October. It is most common in the eastern part of the Issyk–Kul basin, in the Kemin valley, and Kara-Kujur. Rain storms cause lodging of cereal crops, mechanical damage to plants, and wash away the arable layer of soil. During the flowering of maize and fruit crops, heavy rain can wash away pollen, knock down flowers and formed ovaries.

**Hail** is most often observed in the Chuy, Talas, and Issyk–Kul regions throughout the growing season, with two to three cases of hail events per year. Hail is often accompanied by strong wind and rain. In the lower part of the Fergana valley agro-climatic zone, hail can happen from April to July, while in the rest of the valley territory it occurs during the entire cultivation period (MES, 2017).

**Snow avalanches.** There are frequent cases of fatalities (of people and livestock), and destruction of forests, as a result of avalanches. It is estimated that approximately 105 000 km<sup>2</sup> (or 53 percent of the country's territory) is prone to snow avalanches. Within 779 sites of avalanche formation, more than 30 000 sources of snow avalanches have been identified, of which about 1 000 pose a threat to human life (MES, 2015).

**Heavy snow fall and snow storms** occur predominantly during the months of December to February. The late spring and early autumn snow falls can negatively impact agriculture as they damage and destroy crops, flowers, buds, ovaries and uncultivated harvest, and can kill cattle. For instance, in September 2010, on the summer pastures of At-Bashi, Aksay, Arpa, a large number of large and small ruminants were killed as they did not have time to descend into the valleys before heavy snow fall.

**Frosts, ice.** Late spring and early autumn frosts significantly shorten the growing season, damage gardens and vineyards, or lead to a complete loss of tobacco seedlings and vegetables. Frosts are dangerous both at the beginning of the growing season and during the harvest, but they are especially dangerous in late spring, during the full development of the plants. It is likely that such late frosts could happen once or twice over ten years. Frosts also cause significant damage to livestock farms. In May 2018, due to frosts in the Issyk–Kul region, a significant number of livestock was lost, with damage estimated at more than KGS 20 million (USD 290 000) (MES, 2018b). Ice occurs throughout the winter period up to three times per month in the areas of the Chuy and Talas valleys, and causes serious damage to livestock. Eating grass covered with ice causes animals to develop colds.

**Drought events** of low and medium intensity are common in arid zones, which include the lowlands of Kyrgyzstan, such as the Chuy, Talas, and Fergana valleys in the dry season (August to September). The most arid areas are the western Priissykul and Kochkor valley, where drought can last the entire year. Drought significantly reduces yields in rainfed agriculture and in some years, particularly intense and prolonged drought can cause serious damage to perennial plants. Significant drought occurred in Kyrgyzstan in 2012 and 2014. During these years, the prices for dry forage sharply increased, and due to the lack of forage there was a significant loss of livestock, especially in farms in the south of the country. Unfortunately, there are no studies on the impact of drought on agriculture in Kyrgyzstan and there is no regular recording of losses due to drought.

**Erosion processes.** Thousands of hectares of agricultural land annually fall out of circulation, which is unacceptable for a mountainous country in which only 7.5 percent of the territory is suitable for crop production. Erosive phenomena in combination with climate change increase the area of degraded land, reinforcing desertification. An average level of erosion is common to more than half of the country's area, while lands

subject to strong erosion occupy up to one-quarter of the territory of Kyrgyzstan (Shukurov and Korotenko, 2015). According to experts, economic losses due to land degradation are estimated to range from 6.3 percent to 7.6 percent of country's GDP – around KGS 12.6 billion to 15.2 billion (USD 182.6 million to USD 220.3 million). Thus, as a result of land degradation, the opportunity to cultivate more than one million tonnes of wheat, or more than 600 000 tonnes of flour, is missed (Shukurov and Korotenko, 2015).

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## Biological hazards

Due to its climatic and geographical conditions, crop production and animal husbandry practices, Kyrgyzstan is vulnerable to various biological hazards, including animal and plant pests and diseases – epizootics and epiphytotics. The following diseases are a major burden on livestock production and public health: foot-and-mouth disease, *peste des petits ruminants* (PPR), Newcastle disease in poultry, avian influenza, contagious bovine pleuropneumonia, brucellosis, and anthrax. At the same time, the globally eradicated rinderpest is still a risk for the country. Nevertheless, given globalization and climate change, other diseases that have never been seen in Kyrgyzstan are at risk of appearing, some of which, such as the Rift Valley fever (RVF), are zoonotic (GKR, 2014).

There are three endemic focuses of plague in the country – Tian-Shansky, Alai and Talas – which are spatially isolated from each other and cover an area of over 320 000 ha (16.3 percent of the country's territory) (MES, 2015). There are more than 12 009 soil foci of anthrax. A number of quarantine organisms that pose a threat to crop production in Kyrgyzstan have been identified: american white butterfly; eastern moth; californian shchitovka; black and bronze pine barbel; comstock worm; golden potato nematode; fruit tree moth (GKR, 2015a). The most common and dangerous plant diseases include wheat rust; wheat smut; late blight, and potato rots; rice pyriculariasis.

Climate change leads to shifts in the distribution of agricultural pests and diseases across the territory of the country. At the moment, there is an increase in the pest population, and the movement of some of them towards the north. For example, the range of *Leptinotarsa Decemlineata* (Colorado potato beetle) is continuously expanding to the north and east, consistently covering potato-growing zones. At the same time, the habitat of locusts expands to the north. The potential damage from locusts is comparable to the direct costs to farmers from a disaster such as drought. The effects of climate change (an increase in average annual and seasonal temperatures, combined with an increase in absolute humidity) can create favourable conditions for the wider spread of pests, weeds and diseases. This problem requires detailed research, which should play an important role in the development of adaptation measures (Arnell, 2004).

It is also important to mention the risks related to the recent large-scale global health crisis – the COVID-19 pandemic. On one hand, agricultural production seems to be comparatively unaffected and supplies of staple foods are reported to be generally plentiful or stable. However, it is expected that the implications of the pandemic will manifest primarily through the deterioration in food-security conditions, globally as well as in Central Asia. The crisis revealed many fragilities of existing food systems, and some of the challenges already faced by Kyrgyzstan include: the disruption of transportation services in agrifood value chains; a reduction in wages, and financial problems of operators across supply chains, particularly of livestock farmers; limited availability of seeds and fertilizers; and a significant increase in retail prices of most key staple foods. To limit the impact of the pandemic on the food market, in March 2020 the Government of Kyrgyzstan imposed a six-month ban on the export of various products, including wheat grain, wheat flour, rice, vegetable oils, and sugar. It also decided to purchase 33 000 tonnes of wheat from the Russian Federation, which will be distributed among those worst impacted, and to establish an anti-COVID-19 crisis fund, which will also support food security (FAO, 2020a).

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## Human-related activities that are aggravating natural hazards

While Kyrgyzstan's contribution to the global warming is relatively small, it nevertheless depends almost entirely on human activities. The total greenhouse gas (GHG) emissions in 2010 amounted to 13 046 Gg CO<sub>2</sub>-eq.<sup>5</sup> Of this number, 54 percent comes from the energy sector, 34 percent from agricultural activities, and 8 percent from waste (Torgoev, Aleshin and Ashirov, 2019). According to experts, the level of environmental

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<sup>5</sup>Carbon dioxide equivalent in gigagrams (Gg).

pollution in Kyrgyzstan is approaching a level beyond which the potential for biomass production will decrease. As a result of economic activity and the influence of natural factors, a significant part of the soil cover is already destroyed (Institute of Eurasian Studies, 2015).

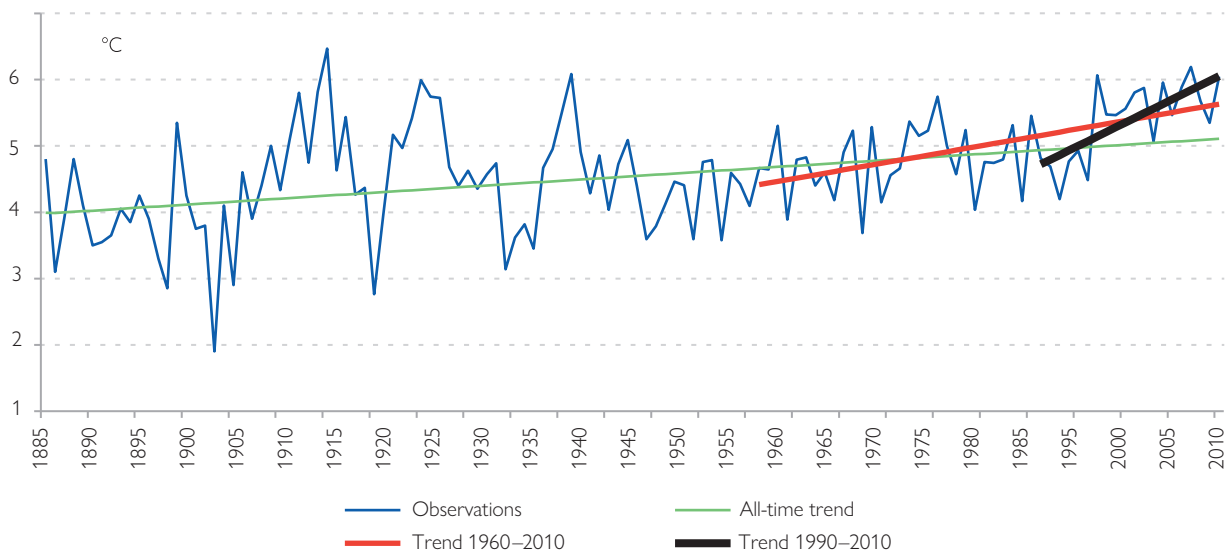
Soil erosion is a particularly severe problem for modern agriculture in Kyrgyzstan. Out of the existing 10.6 million ha of agricultural land, around 60 percent (6.43 million ha) are recognised as degraded and subject to desertification processes. This includes 0.77 million ha of arable land and 4.55 million ha of pastures. The reason lies mainly in the disregard for agricultural technology in the cultivation of crops, and disregard for the rules for using pasture lands. At the same time, 5 million ha (45.7 percent of total agricultural land) are affected by wind and water erosion. Land degradation leads to the disappearance of plant species, unique landscapes and biological diversity, and increases the frequency and magnitude of landslides and mud flows. Seventy percent of all pastures are at different levels of degradation due to overgrazing (Sabirbekov and Abdiev, 2017).

Since 1990, forest area in Kyrgyzstan has increased by almost 16 percent – from 1.14 million ha in 1990, to 1.32 million ha in 2020. Over these three decades, the annual growth of forest cover also increased with each year. At the same time, around 92 percent of total forested area of the country is designated primarily for soil and water protection (FAO, 2020e). While the area covered by forests is increasing year by year, tree density is tending to decrease. The reduction in projective cover occurs mainly due to grazing in forest land and poaching. A decrease in the projective cover of forest land affects the increase in carbon dioxide emissions to the atmosphere, and also contributes to an increase in mud-flow power and the frequency of mud flow and landslide flows. All of the above factors lead to a decrease in the quality of the human environment and pose a threat to the health and safe development of the population of Kyrgyzstan. Reducing the intensity of all types of human activity is a threat to the socioeconomic development of Kyrgyzstan. Moreover, at present, environmental protection costs do not exceed 0.03 percent of country's GDP (Institute of Eurasian Studies, 2015).

## Climate change

Kyrgyzstan has seen a significant increase in temperatures over recent decades (Figure 2). For the entire observation period, the average annual temperature grew throughout the country at a rate of 0.0104 °C per year, while for the 1960–2010 period the rate has more than doubled (reaching 0.0248 °C per year), and for the 1990–2010 period alone the rate of increase was 0.0701 °C per year.

Figure 2. Trend in the average annual temperature in Kyrgyzstan



Source: Ilyasov *et al.*, 2013.

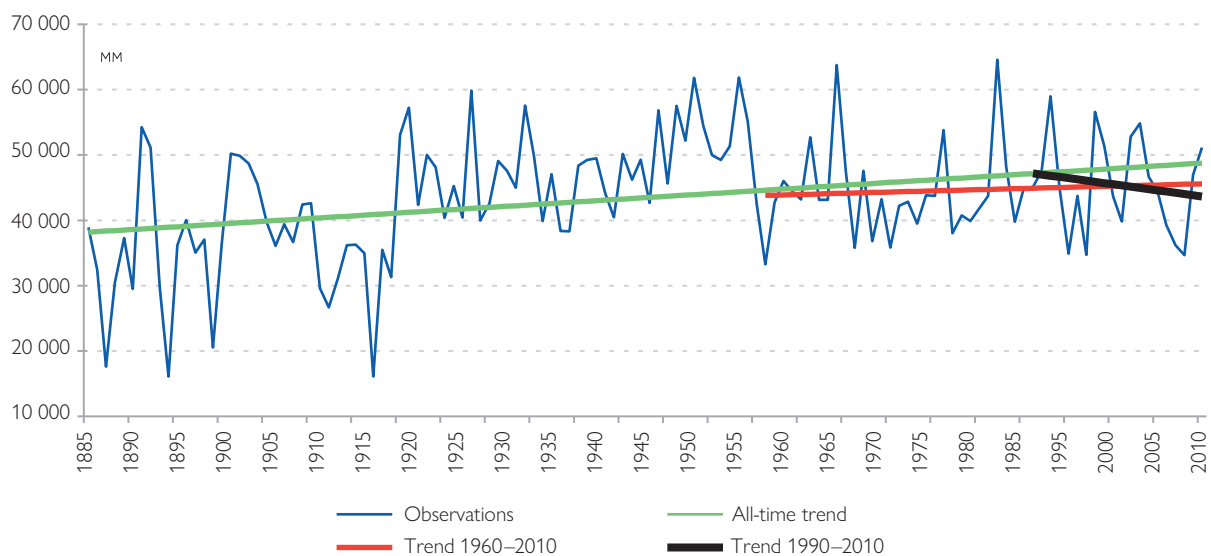
According to climate-change scenarios for 2030–2050, the temperature rise in Central Asia is expected to be around 1 °C to 3 °C, while by the end of the twenty-first century, it may reach 3 °C to 6 °C (IPCC, 2007). Kyrgyzstan saw an average annual temperature increase of 1.6 °C during the twentieth century, which is

significantly higher than the estimated global warming rate of 0.6 °C. The highest increase in temperatures was observed in winter months (2.6 °C), and the lowest in summer (1.2 °C). At the same time, significant differences have been observed within and between different climatic regions (Podrezov and Dikikh, 2012).

An increase in air temperature of 1 °C is expected to lead to an increase of 16 percent in the evaporation rate. Even if precipitation levels stay the same, it will lead to a decrease in river flow (Dikikh and Podrezov, 2007). However, the intensive melting of glaciers will initially lead to a dramatic increase in flow. It is calculated that the volume of runoff from glaciers in Central Asia may increase three-fold by 2050, which will lead to significant changes in the regional water patterns and land use (Arnell, 2004). The rapid melting of glaciers is anticipated to lead to an increase in the frequency of glacial lake bursts, which can result in destructive mud flows in the mountainous regions of Kyrgyzstan. Another negative manifestation of increased runoff is intensified erosion processes (Lioubimtseva and Henebry, 2009).

At the same time, over the observation period, there were quite (statistically) insignificant changes in annual precipitation (Figure 3). However, rather sharp changes – both upward and downward – were observed in some regions (for instance, in the Suusamyr Valley).

Figure 3. Precipitation trend for the period of instrumental observations, 1885–2010

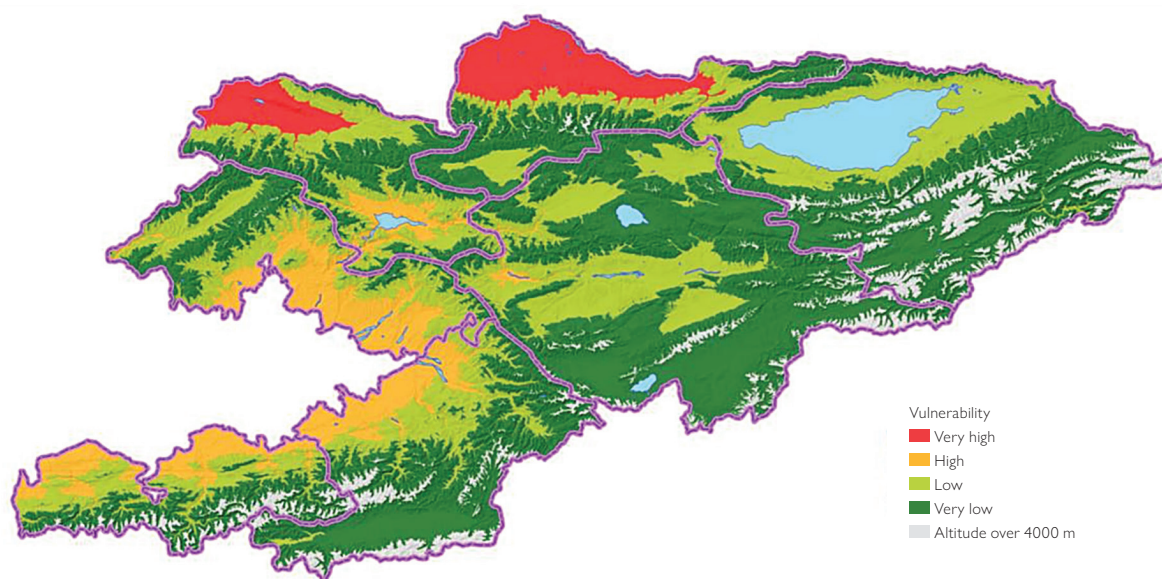


Source: Ilyasov *et al.*, 2013.

Climate change is expected to affect adversely the quality of agricultural land, crop production, and the country's food security. According to studies conducted by the Kyrgyz Institute of Water Problems and Hydropower of the National Academy of Sciences, it is anticipated that the fertility of arable lands will decrease due to climate change and that the deserts and semi-deserts will expand – from 15 percent in 2000 to between 23 percent and 50 percent in 2100 (GKR, 2017).

In terms of sensitivity analysis, an assessment was made in a synthesis report by the International Fund for Agricultural Development (IFAD) on the impact of climate change on pastures and livestock systems in Kyrgyzstan (Figure 4). This study showed that within altitudes of up to 1 500 metres above sea level, the main sensitivity factor will be heat stress in summer, while a slight increase in rain in spring will have a beneficial effect on the forage yields of irrigated fields. However, in the long run, with the melting of glaciers and a decrease in the amount of water in rivers, the sensitivity of irrigated crops will increase significantly. Softer winters will benefit pastures and livestock. Rain can increase in spring, autumn and winter, and remain stable in summer. With these changes, pastures and livestock will have better conditions, despite the growing likelihood of water shortages in summer in certain places (more detailed studies of the water balance are required). The most important hazards are river flooding, landslides and waterlogging in the spring, and snow melting in the summer (IFAD, 2013).

Figure 4. Levels of pasture vulnerability to climate change



NOTE: The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

Source: IFAD, 2013.

Growing conditions for crops may change within the context of predicted glacier degradation, changes in precipitation and temperature, leading to lower yields. The impact of climate change on farm animals also requires more thorough research. The projected decline in crop yields and livestock productivity will have an adverse impact on the population, especially on those residing in rural areas and dependent on the agricultural sector for their income, livelihood, and food security. It is expected that climate change will lead to higher economic losses (Domashov, Korotenko and Koshoev, 2012; IFAD, 2013), due to an increase in:

- number and severity of geophysical hazards (such as landslides, mud flows, glacial lake bursts);
- extent of hydrometeorological and biological hazards;
- frequency and intensity of drought, forest and steppe fires, especially in foothill zones;
- initial increase in runoff due to glacier melting, that can potentially accelerate soil erosion;
- number of autumn and spring frosts, snow falls and summer flooding, change in their timing;
- outbreak of new types of pests and infections of plants and animals that are not endemic.

## Damage and loss data of past disasters in the agricultural sector

The annual damage to Kyrgyzstan's agriculture from climate-based extreme events by 2100 may amount to more than KGS 3.4 billion (USD 48.7 million) (GKR, 2017). As Table 1 shows, the greatest economic damage occurs from the loss of wheat, sugar beet, and vegetables. The statistical series of damage data is small, as the damage assessment methodology was developed relatively recently, and constant observations were carried out only for a relatively short period of time.

There is currently no systematic assessment of the economic damage from disasters in the livestock sector in Kyrgyzstan. Only direct losses are taken into account in cases when the disaster is widespread. According to international experts, in 2011 the economic damage from three diseases (brucellosis, echinococcosis, and foot-and-mouth disease) amounted to around USD 50 million, while the annual damage from especially dangerous animal diseases for each species ranges from USD 15 million to USD 25 million (UNEP, 2008). Cases of cattle death can also occur due to rare snowy cold winters, but the local population does not always report such cases, since it hides the true number of cattle. According to the Ministry of Agriculture, Water Resources and Regional Development (MAWRRD), from the beginning of 2012, due to snowy and cold winters, the number of dead and slaughtered animals amounted to about 47 000 animals, while agricultural producers suffered damage estimated at about KGS 380 million (USD 8.1 million).

Table 1. Average annual damage from all types of climate-related disasters (including drought and lack of water resources) for major crops, 1991–2011

<b>Crops</b>	<b>Damage from all emergencies, USD thousand (2005)</b>	<b>Damage from drought and water scarcity, USD thousand (2005)</b>	<b>Share of drought/water scarcity damage in total damage, %</b>
<b>Total</b>	<b>14 038.18</b>	<b>11 981.98</b>	<b>85.35</b>
Wheat	6 560.26	5 826.35	88.81
Barley	934.68	728.46	77.94
Rice	237.82	182.96	76.93
Corn for grains	996.04	820.10	82.34
Leguminous	28.16	26.68	94.74
Oats	2.68	2.07	77.24
Tobacco	251.66	202.54	80.48
Sugar beet	2 216.86	2 066.22	93.20
Oilseed	202.36	165.50	81.78
Potato	249.57	143.40	57.46
Vegetables	2 358.09	1 817.60	77.08

Source: SAEPF, 2016.

# Agriculture and food security profile

## Agricultural resources

### Land resources

According to the state land fund of Kyrgyzstan (GKR, 2016a), agricultural land occupies around 10.5 million ha (or around 55 percent of the country's total territory), including more than 1 million ha of irrigated land. Table 2 provides an overview of the types of agricultural and other land in Kyrgyzstan.

Table 2. Distribution of agricultural land by type and other land areas, as of 1 January 2016

Types of agricultural and other land	Area, total, (ha)	Including irrigated area, (ha)	Share of irrigated land, (%)
Arable land	1 205 298	794 805	65.94
Perennial plantations, total, including:	36 856	36 311	98.52
Gardens	28 585	28 040	98.09
Berry fields	85	85	100.00
Vineyards	4 854	4 854	100.00
Nurseries	281	281	100.00
Mulberry plantations	2 635	2 635	100.00
other	416	416	100.00
Fallow land	35 932	2 117	5.89
Hayfields	169 696	8 707	5.13
Pastures, total	9 030 890	28 820	0.32
of which: cultural, including areas of radical improvement	3 538	3 442	97.29
Total agricultural land	10 478 672	870 760	8.31
Forest area	1 172 006	11 999	1.02
Tree-shrubs	462 957	8 366	1.81
Swamps	6 248	–	–

Source: GKR, 2016a.

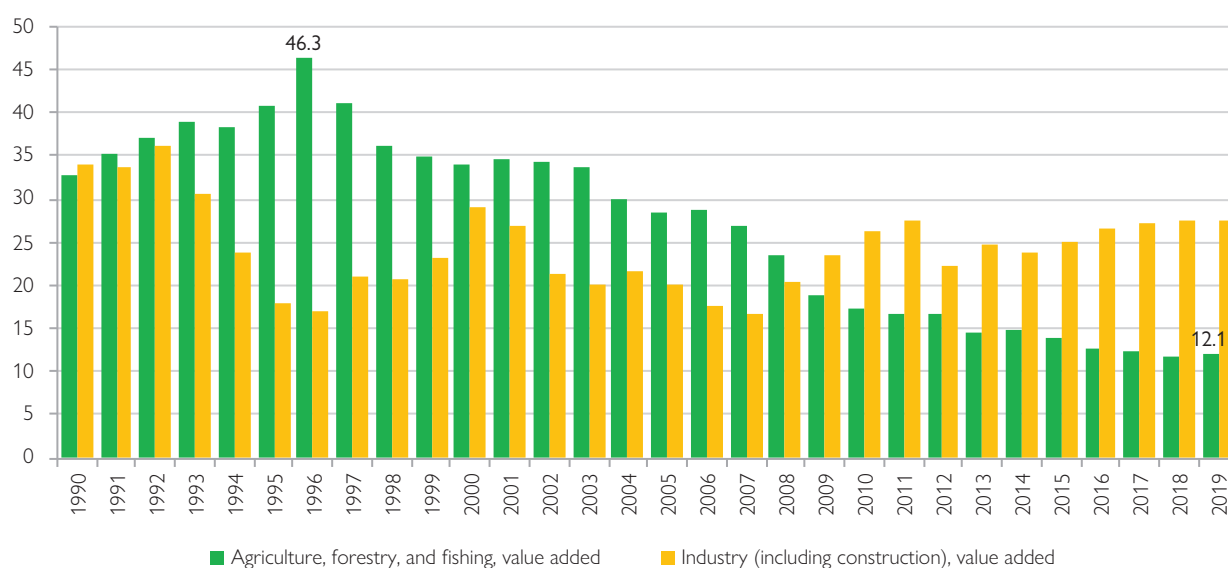
Irrigated arable land accounts for about 4 percent of the country's total territory, and the main crops are produced on this type of land. However, over recent years, a reduction in irrigated arable land has been observed, possibly as a result of urban expansion that was often happening at the expense of arable land. This is happening even though flat land makes up only 11 percent of the total area of the country, of which only 6 percent can be used for irrigated agriculture. Only around 12 percent of all agricultural land in Kyrgyzstan is arable (1.2 million ha in 2020), a significant proportion of it being under irrigation (NSC, 2021a). At the same time, this limited land is still sometimes not used for agricultural production for a number of reasons, namely rare rain, remoteness, and stoniness, lack of watering and malfunctioning of the irrigation network, salinisation and waterlogging, the expansion of settlements, as well as a shortage of funds.

### Main types of agricultural products

In 2019, Kyrgyzstan's GDP was USD 8.45 billion (NSC, 2019b), with the agricultural sector accounting for 12.1 percent of that (NSC, 2019c). Since 1996, the share of agriculture as a proportion of the country's GDP has been declining (Figure 5). The main agricultural output is crop and livestock production (49.5 percent

and 48.1 percent of gross agricultural output, respectively), with fishing playing an insignificant role (FAO, 2020b). However, the yield for individual crops is unstable and varies from year to year, since agriculture is most dependent on climate (changes in temperature, precipitation and adverse weather events, such as frost, drought, hail, strong rain, and so on).

Figure 5. Share of agriculture and industry in Kyrgyzstan, 1990–2020 (% of GDP)



Source: World Bank, 2021.

After Kyrgyzstan's independence, for a few years agricultural production dropped quite significantly, but since roughly 1995 it started a rather steady growth (both in terms of volume, and total monetary value). The gross agricultural output grew from less than USD 0.5 billion in 1995 to more than USD 0.8 billion in 2010, and reached USD 1.035 billion in 2019 (World Bank, 2021). Over the years, the volume of crop production fluctuated rather noticeably, unlike livestock, which showed quite a steady increase (NSC, 2021b). Some of the indicators of agricultural production are shown in Table 3. The production of grain, sugar beet, vegetables, meat, milk, and eggs has grown quite steadily over recent years, while tobacco production has declined significantly. Following government plans, the area under sugar-beet cultivation almost tripled in 2016, while two additional sugar factories were put into operation.

Table 3. Production of the main types of agricultural products in farms of all categories (thousand tonnes, unless specified)

Products	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Grain (in weight after refinement)	1 584	1 581	1 438	1 813	1 446	1 723	1 728	1 682	1 742	1 781
Cotton (at recorded weight)	74	101	85	69	69	44	52	65	75	80
Tobacco (at recorded weight)	10	10	7	7	4	1	1	2	2	1
Sugar beet (factory)	139	159	102	195	174	183	705	712	773	741
Potato	1 339	1 379	1 313	1 332	1 321	1 416	1 388	1 416	1 447	1 374
Vegetable	812	821	866	882	920	1 052	1 069	1 087	1 095	1 134
Gourds	157	152	193	196	200	249	237	259	249	246
Meat (carcass weight)	188	190	192	193	203	208	212	217	221	226
Raw cow's milk	1 360	1 358	1 382	1 408	1 446	1 481	1 525	1 556	1 590	1 628
Eggs, million pieces	373	393	418	422	446	433	470	511	533	561
Wool by weight	11	11	11	12	12	12	12	13	13	13

Source: NSC, 2021c.

It is also important to note that Kyrgyzstan is the only country in Central Asia that underwent mass land privatization, which happened mainly around 1996–1999 and resulted in family farmers owning land plots (UWUA, 2018). Currently, around 90 percent of arable land belongs to the private sector (FAO, 2020b). This is



particularly significant in the context of DRR in agriculture as access to land and secure tenure rights reduce households' vulnerability and increases their resilience to shocks. However, even with progressive legislation and privatized land, women still have less secure tenure to land, since they are less likely to be sole owners of land and prevailing traditional practices prevent women from inheriting land. While Kyrgyzstan has a functioning land market, it also suffers from fragmentation of agricultural land (UWUA, 2018).

As of 1 January 2020, more than 453 000 active economic entities operating in the field of agriculture, forestry and fisheries, were registered in Kyrgyzstan. Of those, 342 100 (or 75.5 percent of the total number) were private

Table 4. Volume of gross agricultural output in 2019, by category of farm (%)

	Total agricultural production	Crop production	Livestock production
State enterprises	0.29	0.52	0.04
Collective farms	1.62	2.03	1.18
Peasant farms	62.70	74.07	50.60
Individual entrepreneurs	35.39	23.38	48.18

Source: NSC, 2021c.

peasant farms,<sup>6</sup> while 110 100 entities (or 24.3 percent) were individual entrepreneurs engaged in agricultural production. There were only 464 registered collective farms and 31 state enterprises (NSC, 2021c). State and collective agricultural farms together produced less than 2 percent of the total volume of gross agricultural output in 2019, while peasant farms and individual household plots accounted for the remaining 98 percent (Table 4. Volume of gross agricultural output in 2019, by category of farm (%)<sup>4</sup>) (NSC, 2021c). Farms are mainly formed by representatives of one family. Typically, each farm is engaged in both crop production and animal husbandry.

Peasant farms own the largest share of agricultural land – around 87.4 percent in 2015 – followed by rural households with 8.3 percent.<sup>7</sup> In 2015, state and collective farms together owned only 4.3 percent of such land – their share had halved since 2006 (FAO, 2020b). The agricultural sector is dominated by small farms. The average farm size is between one and three hectares, including the arable land rented through the National Fund for the Redistribution of Agricultural Land. Between 95 percent and 99 percent of all farms in the country are smaller than five hectares (Hartvigsen and Gorgan, 2020). In fact, in the southern regions, the average size is usually 0.6 ha to 1.1 ha, while in the northern regions it is 1 ha to 5 ha. This uneven distribution exists because the size of a farm depended on local conditions at the time of land reform (population density, and availability of land). Thus, average sizes of farms vary greatly across the country (FAO, 2020b).

Despite the steady growth in the production of basic agricultural products, commodity circulation is not growing as much, which indicates market fluctuations and inflation (World Bank, 2018a). The development of the agrifood sector is hindered by a number of shortcomings in the operation of the market mechanism. These include, in particular, ineffective functioning of resource markets, a lack of provision of services (such as agricultural consultancy, transport and marketing) and high transaction costs (associated with access to key resources and services such as water, electricity, dissemination of knowledge and experience, or extension services, logistics). Information asymmetry also leads to a weakening of ties between small farms and small enterprises. Government intervention in these areas is needed to improve access for smallholders and agrifood industries to markets, to create additional opportunities for them to benefit and improve their livelihoods (World Bank, 2018a).

## Food security profile

### Socioeconomic information

In 2020, the country's rural population was estimated at 4 292 457 people, or 65.8 percent of the total population. Fifty-seven percent of rural population are of working age,<sup>8</sup> 35.3 percent are younger than working age, and the remaining 7.7 percent are older (NSC, 2021d). Approximately 541 400 people, or 13.6 percent of the rural

<sup>6</sup>A peasant farm is an independent economic entity whose activities are based primarily on the personal labour of members of the same family who jointly produce agricultural products.

<sup>7</sup>A family-based type of small farm that uses their own kitchen garden land plot.

<sup>8</sup>15 years or older.

population, are employed in the agriculture, forestry and fisheries sector (NSC, 2018b). The average monthly salary of employees working in the sector was KGS 11 222 (or around USD 134) in 2020, being among the lowest in the country, compared to other types of economic activity (the average salary across all activities was around USD 222). The only other sectors with lower salaries were arts, entertainment and recreation, and human health and social work activities (NSC, 2021e). The majority of the economically active population resides in rural areas – calculated at about 1.67 million people (or 65.6 percent of the workforce). In terms of gender, around 41 percent of the economically active population are women, and 59 percent are men (NSC, 2018c).

## Food production and food security

According to the latest estimates, 6.6 percent of the population in Kyrgyzstan cannot meet the daily minimum dietary energy requirements (FAO *et al.*, 2020). The situation improved since the 2000s when more than 10 percent of the population could not meet the requirements, indicating that food supply and purchasing power have increased. The increased food supply resulted from both domestic production and imports. Kyrgyzstan has the potential capacity to meet its domestic food consumption needs, but to date, these goals have not been achieved. In 2014–2015, the export value of food and beverages amounted to one-quarter of imports, while by 2016–2019 it amounted to more than one-third of imported products (Table 5). Some of the main agricultural exports include vegetables, cotton, dairy products, fruits and nuts; the main imports include tobacco, fruits and nuts, flour products, animal or vegetable fats and oils, and beverages (FAO, 2020c).

Table 5. Import and export of food products and drinks (USD thousands)

	2014	2015	2016	2017	2018	2019
Import	746 818.6	549 814.5	458 428.3	547 059.5	498 079.7	573 495.4
Export	180 172.9	134 876.1	169 103.0	187 335.4	182 430.2	228 447.7
Export / Import, %	24	25	37	34	37	40

Source: NSC, 2021f.

The following basic products have been identified by the government for assessing the level of food self-sufficiency (GKR, 2008): bread and bakery products, potatoes, fruits and berries, vegetables and melons, sugar, vegetable oil, milk and dairy products, meat and meat products, and eggs. At present, Kyrgyzstan is able to support itself only with three of the listed products, namely potatoes, vegetables, and milk and dairy products, while it has to import all other products. Almost half of all agricultural exports in 2017 (worth USD 264 million) went to the Russian Federation, Kazakhstan, and other former USSR countries (Dubashov *et al.*, 2019).

**Vegetables** (including potatoes). Over the past two decades, both the harvesting area and the production of potatoes have increased (an 88 percent increase in average potato production between 2000 and 2017). As a result, the country exceeds its own needs for the consumption of potatoes, while an excess is exported (WFP, 2018). On average, domestic production of vegetables exceeds domestic needs (140 percent of the total demand), providing a stable export item. **Vegetable oil.** The production of vegetable oil (concentrated mainly in the Jalal-Abad region) is very low and amounts to 19.8 percent of the country's needs; it therefore relies on imports.

**Milk and dairy products.** The country produces 1 483 300 tonnes of milk annually (average for 2013–2017). Over the past five years, milk production has been growing steadily and far exceeds the amount needed for consumption in the country (WFP, 2018).

**Wheat.** The production of wheat, the main product in the diet of Kyrgyz people, has been declining in recent years. The country's own production of wheat basically covers domestic needs; however, due to the low quality of wheat, in 2017 it provided only 48 percent of the need for wheat flour, with the remainder needing to be imported. Wheat imports have increased by 70 percent over the 2006–2015 period (WFP, 2018).

**Sugar.** In 2017, sugar beet production drastically increased, due to the construction of two new sugar processing plants, reaching 712 278 tonnes – which is 389 percent higher compared with 2015 (WFP, 2018). Kyrgyzstan still imports most of its sugar (up to 50 percent of the total demand), which makes it dependent on external prices. However, the country has developed a strategy for the development of food and processing industries in 2017–2022, according to which it is expected to modernize the infrastructure of sugar factories, which should lead to an increase in sugar yields (WFP, 2018).

**Meat.** Livestock is the main source of income and livelihood of the rural population and accounts for 45.6 percent of the gross agricultural output. Meat production is growing steadily and can be found in all regions of the country. However, the national average shows insufficient meat production for domestic consumption. The number of livestock in the country directly affects the overall increase in meat production. In 2011, the total livestock in Kyrgyzstan amounted to 5.9 million head, and in 2017 it reached 7.7 million. Livestock is mainly concentrated in the mountainous regions of Naryn, Issyk-Kul, Batken and Osh (WFP, 2018).

**Egg** production is growing in all regions of Kyrgyzstan; however, today, domestic production provides only 41.1 percent of the total demand for the product.

**Fruit and berries.** The production of fruit and berries has been growing steadily over recent years, but it should be kept in mind that it is unevenly distributed throughout the country due to climatic conditions. The country's own production of fruit and berries covers only 28.9 percent of domestic needs.

## Poverty and malnutrition

Over the past ten years, the proportion of the population living in extreme poverty has decreased from 3.1 percent to 0.5 percent over the 2009–2019 period (WFP, 2018). However, in 2019, approximately 1.3 million people (20.1 percent of the population) still lived below the poverty line (USD 1.30 per day), of whom 73.8 percent resided in rural areas. In the southern regions of the country, the poverty rate is even higher. In 2019, the highest poverty level was observed in Batken (32.6 percent), Naryn (28.1 percent), and Jalal-Abad (26.9 percent) regions (NSC, 2020a). Some level of gender inequality is observed as well, particularly in Naryn region (where, in 2017, 30 percent of women were living in poverty, compared with 28 percent of men) and Osh (13 percent of women and 16 percent of men) (WFP, 2018).

Expenditures on food make up a significant part of household spending in all regions of the country. It is estimated that in 2017, the residents of Kyrgyzstan spent on average 31 percent of their income on food. The highest proportion was observed in the Issyk-Kul (34 percent), Osh (33 percent) and Chuy (32 percent) regions. The poorer segment of the population spent an average of 66 percent of their budget on food, with the highest rates in the Talas (84 percent) and Naryn (81 percent) regions, and the city of Bishkek (74 percent) (WFP, 2018). Over recent years, prices for many foods have been growing rather steadily, especially the price of meat (lamb, beef, chicken), with some noticeable acceleration around 2011 and 2020 (NSC, 2021e).

Kyrgyzstan is among the countries where malnutrition and micronutrient deficiencies are considered key nutrition issues. Among adults, however, obesity is still a more serious problem than malnutrition (FAO, 2017). In the 2004–2006 period, undernourishment was affecting 9.1 percent of the total population, while in 2017–2019 this share decreased to 6.4 percent (FAO *et al.*, 2020). It is estimated that the proportion of the population consuming less than 2 100 kcal per day was around 46.4 percent in 2018 (on average across the country), but is significantly higher in areas with a high level of poverty – for example, 70.1 percent in Osh city, 54.6 percent in Batken oblast, and 51.8 percent in Bishkek. In addition, there is a gender imbalance in consumption, with 55 percent of women, and 42 percent of men, eating less than 2 100 kcal per day (NSC, 2019a).

A limited consumption of diverse and healthy foods is observed among poor households, who have limited access to more expensive products such as meat, fish, fruits, butter, cottage cheese, and other foods high in protein, fats, and vitamins. As a result, a significant portion of the population consumes excess amounts of starchy foods and those that are high in sugar, which can lead to being overweight and obesity (NSC, 2019a). In 2019, obesity prevailed among 12.9 percent of women and 8.5 percent of men (NSC, 2020b). In Kyrgyzstan, 60 percent of children between the ages of 6 and 23 months consume the least varied foods. In 2019, the proportion of children under the age of five suffering from malnutrition was 2 percent; and from being overweight, 6.9 percent (FAO *et al.*, 2020). In the 1–6 year-old age group, around 8.6 percent of children suffered from being underweight (NSC, 2020b). In 2016, around 16.6 percent of the adult population was considered obese, which can be associated with the consumption of cheap, high-calorie and fatty foods (FAO *et al.*, 2020).

Kyrgyzstan is a country that relies heavily on remittances from labour migrants. Available data on migrants is often contradictory, but in 2018 there were around 640 000 migrants from Kyrgyzstan – around one-quarter of country's economically active population, coming mostly from the southern regions – in the Russian Federation, the main destination of migrants. The share of unskilled labour is growing (reaching 55 percent in 2013), as

well as the share of women among migrants (currently at around 40 percent). This situation has a direct effect on agricultural activity of many rural households, especially the poor ones – households are becoming more reliable on remittances, while farming knowledge is being lost, as many young people (of mainly 18 to 29 years old) are leaving the country and do not plan on working in the farm in future (FAO, 2020b).

Remittances from labour migrants play an important role in Kyrgyzstan. The volume of remittances has increased over the past decade (NSC, 2016). According to the National Bank of the Kyrgyz Republic, in 2017 labour migrants transferred approximately USD 2.48 billion, which is slightly more than the income of the state budget of the country (NSC, 2017b). In 2020, remittances were among the main sources of income of the population, accounting for 15.8 percent of the total amount (NSC, 2021a). At the same time, remittances make the country vulnerable to the economic stability of other countries, such as the Russian Federation and Kazakhstan, where most remittances come from. According to the country's National Statistical Committee, the level of poverty would increase from 20.1 percent to 31.2 percent if remittances were excluded. Some regions would be affected more severely – in Batken region, poverty would increase by 21.1 percent (reaching 53.7 percent), and in Osh oblast by 23.7 percent (reaching 37.3 percent). Remittances significantly affect the extreme poverty line as well, which would increase from 0.5 percent to 11.4 percent, if income from remittances was excluded (NSC, 2020a).

WFP, together with the Ministry of Agriculture and the National Institute for Strategic Studies, developed an online tool for mapping food security in the country – the Food Safety Atlas, which presents an analysis of food safety and nutrition for more than 50 indicators, from agricultural production, to micronutrient intake, and climate change. An overview of regional differences and extensive cartographic data provide a complete picture of food security in Kyrgyzstan (WFP, 2018).

# Institutional structure of disaster risk reduction system in agriculture

## Kyrgyz legislation for disaster risk reduction, climate change and food security

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### International conventions

Kyrgyzstan participates in the following international treaties and conventions on disaster risk management, climate change, and food security:

- Transforming our world: the 2030 Agenda for Sustainable Development;
- Sendai Framework for Disaster Risk Reduction 2015–2030;
- United Nations Framework Convention on Climate Change (UNFCCC);
- Convention on Biological Diversity;
- Nagoya Protocol on Access and Benefit-sharing to the Convention on Biological Diversity;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity;
- Convention to Combat Desertification;
- Vienna Convention on the Protection of the Ozone Layer;
- Kyoto Protocol to the United Nations Framework Convention on Climate Change;
- Convention on Environmental Impact Assessment in a Transboundary Space;
- Montreal Protocol on Ozone Depleting Substances;
- Stockholm Convention on Persistent Organic Pollutants;
- Declaration of the World Summit on Food Security.

According to clause 3 of Article 6 of the Constitution of the Kyrgyz Republic, international treaties, of which Kyrgyzstan is a party, and generally recognized principles and norms of international law, are an integral part of the legal system of the country. Kyrgyzstan has a practice of bringing national legislation in compliance with the norms of international law and this implementation procedure is regulated by the Law of the Kyrgyz Republic on International Treaties of the Kyrgyz Republic (GKR, 1999).

## Legislation of the State Civil Protection System

The Constitution of the Kyrgyz Republic provides a legal basis of the Civil Protection System, while it is regulated by the following laws:

**On Civil Protection** (No. 54, 24 May 2018) regulates relations in the field of civil protection of the population and the territory of Kyrgyzstan in emergency situations, defines the powers and tasks of the government, state bodies, local governments, organizations and the population in solving civil protection issues. Some of the tasks of the SCPS include: forecasting and assessing socioeconomic consequences of emergency situations; collection, processing, exchange and provision of information; emergency prevention and disaster risk reduction (DRR) activities; protection of farm animals, plants, food, food raw materials, forage, water sources and water supply systems in emergency and crisis situations; monitoring and forecasting of emergency situations.

**On ensuring fire safety** (No. 78, 7 June 2016) is aimed at protecting the life and health of citizens, property of individuals and legal entities, state and municipal property from fires, defines the main provisions of technical regulation in the field of fire safety and establishes general fire safety requirements.

**The technical regulation On Fire Safety** (No. 142, 26 June 2011) establishes the general fire safety requirements for products, objects of protection, including buildings and structures, production facilities, fire-technical products and general-purpose products.

**On an emergency status** (No. 135, 24 October 1998) establishes legal norms in a state of emergency. According to Article 3, a state of emergency in Kyrgyzstan is introduced in the event of crises of a biological nature – epidemics, epizootics, epiphytotics, social conflicts, natural hazard-induced disasters, and man-made disasters.

The legal framework for disaster risk management is also enshrined in the following **resolutions** of the Government of Kyrgyzstan (government decisions):

**On Civil Protection Services of the Kyrgyz Republic** (No. 16, 28 January 2019) approves the list of civil protection services of Kyrgyzstan, including the plant and water protection service and the animal protection service, the purpose of which is to ensure phytosanitary and epizootic well-being, and food safety of plant and animal origin.

**On the Interdepartmental Commission on Civil Protection of the Kyrgyz Republic** (No. 344, 30 December 2010) approves the composition and regulation of the Interdepartmental Commission on Civil Protection of the Kyrgyz Republic – the republican level coordinating body of the state system of civil protection. The main tasks of the commission are to lead the development and implementation of a unified state policy in the field of civil protection, to organize and conduct state-wide events in the field of civil protection, to coordinate the actions of ministries, state committees, administrative departments, local state administrations, local governments, international organizations, and conduct of civil protection in the territory of the country.

**Approving regulations on a Unified Information Management System in Emergency and Crisis Situations in the Kyrgyz Republic** (No. 1, 3 January 2011) determines the procedure for organizing and operating a unified information management system in emergency and crisis situations in Kyrgyzstan.

**On Issues of the Evacuation Commission under the Government of the Kyrgyz Republic** (No. 159, 12 April 1996) defines the legal basis for the work of the evacuation commission under the Government of Kyrgyzstan on evacuation of the population during disasters and technological accidents.

**On Approval of the Program for the Creation and Development of the National Integrated Information and Alert System for the Population for 2011-2014** (No. 506, 25 August 2011) defines the legal framework for the organization and operation of information systems designed to accumulate, analyse, process and timely inform the population about possible threats, natural and man-made emergency situations.

**On approval of the Regulations on the Formations of the Civil Protection of the Kyrgyz Republic** (No. 475, 22 August 2011). The regulation contains the legal basis for creating formations of the civil protection services,

including the protection of agricultural plants and animals (veterinary and phytopathological intelligence, animal and plant protection groups).

**Fire Safety Regulations in the Kyrgyz Republic** (No. 381, 22 August 2018) establishes general fire safety requirements at agricultural production facilities, including requirements for operating feed mills, flour mills and cereals plants, bakeries, agricultural production processes, and harvesting grain crops and forage feeds; during the preparation and storage of grass meal, during the collection, transportation, drying, storage and primary processing of cotton, forage storage.

**On the Concept of Integrated Protection of the Population and the Territory of the Kyrgyz Republic from Emergencies for 2018-2030** (No. 58, 29 January 2018). This concept defines the main priorities for the development of the state system of civil protection and its member state bodies, local state administrations, local governments and organizations, focused on comprehensive protection of the population and territories of Kyrgyzstan and the creation of conditions for sustainable development. Some of the concept's priority tasks include:

- increase the effectiveness of the system for monitoring and forecasting various emergencies;
- conduct risk assessment;
- increase the "safety culture" of the population;
- implementation of measures to prevent emergency situations and reduce the level of danger, including in the context of climate change;
- mainstream disaster risk management into state and local government sectors and increase interaction among stakeholders;
- development of an automated management and warning system in emergency and crisis situations;
- implementation of structural work to reduce the threat of emergency situations, adaptation to climate change;
- develop disaster risk insurance and stimulate domestic investment in DRR.

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## Legislation on hydrometeorology

The main legal acts regulating hydrometeorological activity in Kyrgyzstan are the **Water Code** (GKR, 2005) and a number of related laws and resolutions.

**Water Code of the Kyrgyz Republic** (No. 8, 12 January 2005). In accordance with Article 71, at the proposal of the State Water Administration (the authorised state body for water resource management and the authorised state body for hydrometeorology), the Government of Kyrgyzstan created a unified information system that contains data for recent years and forecasts for flooding, mud flows and landslides, drought; current condition of natural water reservoirs, including high-mountain lakes; condition of main water facilities, including dams in reservoirs and protective dams on the rivers; the level of risk to the population in case of flooding, drought, mud flows and landslides.

A number of **laws** regulate the hydrometeorological sector in Kyrgyzstan:

**On hydrometeorological activity in the Kyrgyz Republic** (No. 154, 8 August 2006) aims at legal support for coordinated effective functioning of the hydrometeorological network of the country and harmonisation of the current legislation with international legal norms in the hydrometeorological field.

**On Strategic Objects of the Kyrgyz Republic** (No. 94, 23 May 2008). The strategic objects include property used by hydrometeorological, ecological, sanitary and epidemiological, quarantine services.

**Resolutions** of the Government of Kyrgyzstan:

**The Regulation on the Agency on Hydrometeorology under the Ministry of Emergency Situations of the Kyrgyz Republic (Kyrgyzhydromet)** (No. 130, 5 March 2010) determines the status, tasks, functions, order of organization of Kyrgyzhydromet's activities as a subordinate unit of MES, carrying out activities in the field of hydrometeorology and observations of the level of environmental pollution.

**The regulation on monitoring of the water fund in the Kyrgyz Republic** (No. 19, 25 January 1995) imposes on Kyrgyzhydromet responsibility for monitoring surface water bodies and obliges them to perform the following functions:

- development, management and operation of the observation network on surface water bodies;
- collection, processing, classification and analysis of data on indicators of the state of surface water bodies;
- control and coordination of work related to observations on surface water bodies carried out by ministries, state committees, administrative departments, organizations, etc.;
- formation of a database on the state of surface water bodies;
- maintenance of the water state inventory under the section “surface water”;
- compilation and publication of water balances on surface water bodies;
- preparation of the section “surface water bodies” of the annual report to the Government of Kyrgyzstan on the results of monitoring;
- diagnostics and prediction of the state of surface water bodies;
- informational support of consumers on the state of surface water bodies;
- international cooperation in terms of monitoring the environment and climate.

**The regulation on state registration and control of water use in the Kyrgyz Republic** (No. 19, 25 January 1995) imposes on Kyrgyzhydromet the following functions:

- carrying out state accounting of water storage of surface water bodies in the area of flow formation;
- monitoring of surface water bodies based on the systematic observations at hydrometeorological stations and posts;
- providing forecasting of changes in quantitative indicators of water;
- maintaining the state water cadastre under the section “surface water”;
- providing the compilation and publication of water balances.

**The Regulation on the State Register of Water Management Structures of the Kyrgyz Republic** (No. 19, 25 January 1995) imposes on Kyrgyzhydromet responsibility for maintaining the State Register of Water Management Facilities for the division of water accounting facilities of the hydrological observation network on water bodies.

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## Regulatory acts on the provision of veterinary and phytosanitary security

The legal framework for disaster risk management of a bio-social nature is determined by a number of laws and decrees of the Government of Kyrgyzstan.

**Law On Chemicalisation and Plant Protection** (No. 12, 25 January 1999) defines the general legal, economic, environmental, social and organizational basis of chemicalisation and plant protection in the interests of protecting public, animal, environmental health, preventing or eliminating the consequences of contamination of soil, plant and animal products.

**Law On Veterinary** (No. 175, 30 December 2014) establishes the legal, social, organizational, financial and economic bases in the field of veterinary medicine and is aimed at protecting the population from diseases common to humans and animals, ensuring epizootic well-being and sanitary safety on the territory of Kyrgyzstan. Later amendments to the law strengthened the emphasis on improper performance of professional duties, in particular, violation of legislation in the field of veterinary medicine and hiding the facts of the occurrence of contagious animal diseases and circumstances that threaten their occurrence and spread.

**Law On Plant Quarantine** (No. 2, 12 January 2015) establishes the legal basis for regulation in the field of plant quarantine, defines the powers of state executive bodies, as well as the basic rights and obligations of individuals and legal entities in the field of plant quarantine.



**Resolutions** of the Government of Kyrgyzstan:

**On the determination of safety measures in the field of veterinary medicine, plant quarantine, epidemiology, sanitation and ecology** (No. 901, 30 December 2006) approves the regulation on sanitary-epidemiological, veterinary-sanitary, phytosanitary and environmental measures and conformity assessment procedures in the field of sanitary-epidemiological, veterinary-sanitary, phytosanitary and ecological well-being in the territory of Kyrgyzstan.

**On approval of quarantine phytosanitary rules of the Kyrgyz Republic and the Regulation on the issuance of phytosanitary, re-export phytosanitary and quarantine certificates** (No. 376, 18 June 2015). The quarantine phytosanitary rules of Kyrgyzstan are aimed at preventing or limiting economic damage due to the penetration and establishment of pests that are absent in the country, and the increase in populations of pests that are limited in the country.

**On approval of priority veterinary and sanitary requirements for the prevention of animal diseases** (No. 377, 18 June 2015) is needed in order to implement the action plan (“road map”) for the accession of Kyrgyzstan to the Eurasian customs union of Belarus, Kazakhstan and the Russian Federation.

**On approval of the Rules of veterinary zoning of the territory of the Kyrgyz Republic for infectious animal diseases** (No. 555, 3 August 2015) ensures veterinary and sanitary safety on the territory of Kyrgyzstan and creates conditions for unhindered international trade in animals and animal products, approves the rules of veterinary zoning of Kyrgyzstan for infectious animal diseases.

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## Legislation on food security

The main legal acts of Kyrgyzstan regulating relations in the field of food security are:

**Laws** of the Kyrgyz Republic:

**On food security of the Kyrgyz Republic** (No. 183, 4 August 2008) establishes the main directions in ensuring food security of Kyrgyzstan, which is an integral and important component of national security.

**On the prevention of iodine deficiency diseases** (No. 40, 18 February 2000) defines the system of state measures for the prevention of iodine deficiency diseases in Kyrgyzstan.

**On protection of breastfeeding and regulation of marketing of products and means for artificial feeding of children** (No. 263, 17 December 2008) regulates the relations between state bodies, local governments, legal entities and citizens in this field.

**On the Enrichment of Baking Flour** (No. 78, 11 March 2009) defines the legal basis for providing the population with safe flour enriched (fortified) with a vitamin-mineral or mineral supplement.

**On Public Health** (No. 248, 24 July 2009) is aimed at improving the health of the population through increasing access to public health services and promotion of public health.

**Resolutions** of the Government of Kyrgyzstan:

**Provision on monitoring and indicators of food security of the Kyrgyz Republic** (No. 138, 3 March 2009) was developed in order to manage the state of food security at the country and regional levels. The provision establishes a monitoring system, determines the list of indicators, the procedure for collecting, processing and analysing information. The list includes the following indicators on:

- degree of food security of the republic;
- basic food production to assess the level of national food security in the regions;
- level of consumption by the population of the republic (and at regional level) of food in accordance with the physiological and minimum norms of consumption;

- volume of the domestic food market, the level of domestic production of basic foods and the level of imports into the country;
- level of support for agricultural producers in terms of the national currency unit of output;
- development of food markets and their impact on the food supply of the population;
- costs of food for the population.

**On approval of the average physiological norms of consumption of basic foodstuffs for the population of the Kyrgyz Republic** (No. 111, 19 February 2010) pursuant to the Law of the Kyrgyz Republic On food security of the Kyrgyz Republic, approves the average physiological norms of food consumption.

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## Regulatory framework on adaptation to climate change

The legal basis for climate-change adaptation activities is enshrined in the following **laws**:

**Law On Water** (No. 1422-XII, 14 January 1994) regulates the use and protection of water resources. The objectives of water legislation are to prevent the environmentally harmful impact of various activities on water bodies, to ensure the development of water facilities, strengthening the rule of law in the field of water relations.

**On Fisheries** (No. 39, 25 June 1997) regulates the legal, economic and organizational foundations of fishery in Kyrgyzstan in order to develop it, preserve and increase fish stocks, increase fish productivity of reservoirs and ponds, and fully satisfy the population's needs for fishery products.

**Law On Environmental Protection** (No. 53, 16 June 1999) defines the policy and regulates legal relations in the field of environmental management and environmental protection in the country. Article 8 defines the types of environmental quality standards, including the maximum permissible norms for the use of chemicals in agriculture and the standards for maximum permissible concentrations of chemical, toxic, carcinogenic substances and biological additives in food products.

**The Forest Code of the Kyrgyz Republic** (No. 66, 8 July 1999) establishes the legal basis for rational use, protection and reproduction of forests, increasing their ecological and resource potential, their rational use. One of its principles is the adaptation to the effects of climate change.

**Concept on Forest Development until 2040** and its five-year action plan (Resolution No. 231, 27 May 2019) ensures the sustainable management of forest ecosystems, rational forest management, and in accordance with Articles 22 and 23 of the Forest Code of the Kyrgyz Republic.

**On Mountain Territories of the Kyrgyz Republic** (No. 151, 1 November 2002) aims at creating a socioeconomic and legal basis for the sustainable development of mountain areas of Kyrgyzstan, the preservation and rational use of natural resources, historical, cultural and architectural heritage.

On the accession of the Kyrgyz Republic to the **UN Framework Convention on Climate Change** and the UNECE Convention on Long-range Transboundary Air Pollution (No. 11, 14 January 2000).

On ratification of the **Kyoto Protocol** (No. 9, 15 January 2003) to the UN Framework Convention on Climate Change.

**On the protection of the ozone layer** (No. 206, 18 December 2006) defines the state policy and the implementation of international obligations in the field of environmental protection (Vienna Convention for the Protection of the Ozone Layer, of 22 March 1985; Montreal Protocol on Substances that Deplete the Ozone Layer, of 16 September 1987).

**On State Regulation and Policies on the Emission and Absorption of Greenhouse Gases** (No. 71, 25 May 2007) defines the fundamentals of state regulation, the order of activities, rights, duties and responsibilities of state bodies, local governments, individuals and legal entities in the field of emission and absorption of GHG in the territory of Kyrgyzstan.

**On the protection of atmospheric air** (No 51, 12 June 2009) regulates relations in the field of the protection of atmospheric air. Article 35 identifies measures to prevent the harmful effects of climate change:

- maintaining a national inventory of anthropogenic emissions;
- development, implementation and regular update (at least every five years) of national, regional and sectoral programmes to reduce GHG emissions and to adequately adapt to climate change;
- support the development, application and dissemination, including the transfer of technologies, methods and processes leading to the limitation, reduction or cessation of GHG emissions in all sectors, including agriculture and livestock;
- integrating climate change into social, economic, and environmental policies;
- supporting scientific, technological, technical, socioeconomic and other research, systematic observations and the creation of data banks related to the climate system;
- improving education, training and public awareness on climate-change issues.

**On pastures** (No. 30, 26 January 2009) regulates relations in the field of pasture management.

**On Ecological Expertise** (No. 54, 16 June 1999) regulates legal relations in the field of ecological expertise, aims to implement the constitutional right of citizens to a favourable environment by preventing negative environmental consequences arising from the implementation of economic and other activities.

**On the sanitary-epidemiological well-being of the population** (No. 60, 26 June 2001) is aimed at ensuring the sanitary-epidemiological well-being of the population and establishes the guarantees of the state in the implementation of the constitutional rights of citizens to health protection and a favourable environment.

**On the protection and use of flora** (No. 53, 20 June 2001) establishes the legal framework for ensuring the effective protection, rational use and reproduction of flora resources.

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## Legislation on disasters risk insurance in agriculture

The main regulatory and legal acts managing relations in the field of insurance in agriculture against natural hazards and man-made disasters are the following:

Law **On the features of insurance in crop production** (No. 31, 26 January 2009). At the request of the authorised state body for the hydrometeorological service and the authorised state body for emergency situations, the Government of Kyrgyzstan approves the criteria and characteristics for identifying adverse natural phenomena, the standard form of a certificate confirming the occurrence of an unfavourable natural phenomenon, the procedure for creating commissions to determine the size of areas affected by the adverse natural phenomena, the form of the protocol of adverse natural phenomena inspection, as well as the organization of their work.

Law **On compulsory insurance of residential premises against fire and natural hazards** (No. 209, 31 July 2015) defines the legal, economic and organizational basis for compulsory insurance of residential premises against fire and natural hazards.

Resolution **On approval of acts in the field of compulsory insurance of residential premises against fire and natural hazards** (No. 49, 2 February 2006) covers the rules of compulsory insurance of residential premises against fire and natural hazards, minimum insured amount and the insurance premium rate, method for calculating the amount of insurance compensation, procedure for information interaction of state bodies and other organizations in the system of compulsory insurance.

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## Concepts of disaster risk reduction, climate-change adaptation and food security

The strategic goals, objectives and actions in disaster risk management, adaptation to climate change, and food security, are defined in the National Development Strategy of the Kyrgyz Republic for 2018–2040 (GKR, 2018c), and the Development Programme of the Kyrgyz Republic for the period 2018–2022 (“Unity, trust,

creation”) (GKR, 2018d). In the section “environment, adaptation to climate change and disaster risk reduction”, strategic planning is based on the interrelation of economic activities that reduce poverty and ensure social progress, with ecological sustainability of natural ecosystems, sustainable development through elements of “green development”, introducing measures to adapt to climate change, and reducing the risks of disasters threatening the country’s food security (GKR, 2018c). The most important cross-cutting areas of development are environmental aspects, which provide the development and active implementation of measures to respond to existing and potential risks in the form of man-made disasters and climate change, primarily through measures of mitigation and adaptation.

The systematic analysis of the country’s disaster risk management problems and the main actions to address them are set out in the Concept of Integrated Protection of the Population and Territories of the Kyrgyz Republic against Emergencies for 2018–2030 (MES, 2018a). This document (a concept on DRR) is based on the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNISDR, 2015). The priority areas of the concept on DRR are:

- increase knowledge of disaster risk;
- improve the institutional framework for disaster risk management;
- invest in DRR measures to strengthen resilience;
- improve disaster preparedness to ensure an effective response.

The priorities define a number of tasks, such as:

- improving the effectiveness of the monitoring and forecasting system based on the combination of actions of state, scientific, educational organizations and institutions, and through the involvement of civil society;
- conducting disaster risk assessment and research work aimed at ensuring a scientifically based approach in planning and implementing emergency response measures and improving preparedness for response, and taking risk into account in development planning;
- increasing the safety culture of the population through a broad campaign to raise public awareness and improve the approaches and forms of public education;
- development of the regulatory legal framework and organizational structure of the state system of civil protection;
- mainstreaming disaster risk management into government and local government sectors and increasing interaction among partners;
- development of an automated management and warning system in emergency and crisis situations;
- implementation of structural work to reduce the risks of emergency situations, adapt to climate change, and improve the material and technical equipment of specialised services;
- development of a disaster risk insurance system, of investment promotion mechanisms, and a social protection system;
- implementation of measures to assess the resilience, reconstruction and repair of economically and socially significant facilities;
- increasing the level of preparedness and response capacity, including emergency services;
- development of a training system for officials for the organization and maintenance of civil protection;
- implementation of measures to improve curricula and training methods for state and municipal employees;
- improving coordination mechanisms in post-emergency recovery.

The concept formulates the main expected results:

- ensuring full coverage of the early warning system;
- reducing mortality from disasters by 2030 to a minimum;
- reduction of direct economic losses and damage by 2030 to a minimum;
- increasing the sustainability of life support facilities (hospitals, water transport hubs, communication lines, etc.) of the population in case of emergency situations.

The following activities should be noted among the actions to address the objectives of the concept on DRR related to disaster risk prevention in agriculture:

- creation of an organizational and legal basis for an integrated emergency monitoring system, data collection and processing;
- creation of a data processing centre for an integrated system for monitoring and forecasting of emergency situations;
- creation of a web portal with information on monitoring of emergency situations and creation of mechanisms for involving the population in hazard observation;
- creation of mobile points for monitoring and forecasting emergency situations and upgrading specialised monitoring networks;
- creation of a centre for glaciological research and climate change to monitor glaciers and breakthrough lakes;
- assessment of seismic resistance of residential buildings in areas with a seismicity of eight or more points, and the creation of a corresponding database;
- development and improvement of statistical reporting forms in the field of civil protection, including the assessment of damage and loss;
- conducting epizootic zoning of the territory of Kyrgyzstan;
- creation of a network of sanitary infrastructure to ensure veterinary safety;
- improvement and implementation of the information policy concept in the field of civil protection;
- improvement of approaches and forms of public education in order to enhance the safety culture of the population;
- connecting regions of the country to a unified duty dispatch service (system 112);
- improving the system of compulsory home insurance against disasters caused by natural hazards;
- development of project proposals and implementation of projects aimed at improving resilience to climate change;
- implementation of the “green project”;
- modernization of irrigation systems to prevent emergencies;
- recultivation of tailings and dumps in the villages of Min-Kush, Kaji-Sai, Shekaftar;
- development of minimum standards for the provision of humanitarian assistance, taking into account age and gender.

The Concept on DRR identifies potential sources of funding. The volume of necessary financial resources for the implementation is KGS 9.84 billion (USD 142.6 million) in total, of which KGS 5.31 billion (USD 76.9 million) comes from the state budget, KGS 3.56 billion (USD 51.6 thousand) from local budgets, and KGS 4.53 billion (USD 65.6 million) from extra-budgetary funds. In reality, KGS 7.01 billion (USD 101.6 million) is available for the implementation of measures, of which KGS 4.19 billion (USD 60.6 million) comes from the state budget, KGS 77.9 million (USD 1.1 million) from local budgets, and KGS 2.75 billion (USD 39.9 million) from extra-budgetary funds. The gap in financial support for the implementation of the activities of the Concept on DRR is KGS 2.83 billion (USD 41 million), which is 28.75 percent of the total budget (MES, 2018a). In the Concept on DRR, it was noted that one of the implementation risks is a reduction in annual funding. The main donors to support implementation of the concept are UNDP, the World Bank, the European Bank for Reconstruction and Development (EBRD), the Government of the Russian Federation, the German Development Bank, and other international institutions.

In Kyrgyzstan, the Program for the Adaptation of Agriculture and Water Management to Climate Change for 2016–2020 (MAFILR, 2016a) has been approved and implemented – its purpose is to determine the vulnerability of agriculture and water management systems, and the development of measures for the adaptation of agriculture and water management to climate change. The objectives of the programme are to improve the resilience of agriculture to climate change by increasing or stabilizing crop yields and the productivity of agricultural animals through preventive measures that would mitigate the effects of global climate change on agricultural production and food security.

The programme contains an analysis of the current situation in agriculture, an assessment of the impact of climate change and the vulnerability of different sectors, including crops, livestock, grassland and water resources, analysis of adaptation mechanisms and the identification of priority measures for adaptation to climate change in the country’s agriculture and water use. Some of the measures include: the creation of an independent service

for land resources; strengthening the inspection of soil protection; monitoring and assessing the state of soil cover; carrying out forest melioration measures; reclamation of saline and alkaline soils; selection of drought-resistant varieties and hybrids of agricultural crops; drip irrigation; increase the stations of artificial insemination; rehabilitation of remote mountain and pastures near the villages; implementation of automatic accounting and distribution of irrigation water; construction and rehabilitation of irrigation facilities. However, there is a large financial gap between financing needs and available financial resources. There is no clear definition of the expected results required for monitoring and evaluating the implementation of the programme.

Currently, the State Agency for Environment Protection and Forestry of the Kyrgyz Republic, in collaboration with ministries and departments, is actively working on the development of a Strategic Program for Adaptation to Climate Change (DPCC, 2020), which would act as a mechanism for planning climate investments in Kyrgyzstan. It would outline priority areas of investment in adaptation to climate change for the priority sectors of the economy. The development of the strategic programme is supported by international financial institutions led by the EBRD, Asian Development Bank, the World Bank, and the community of development partners in Kyrgyzstan.

The Food Security and Nutrition Program in the Kyrgyz Republic for 2015–2017 (GKR, 2015b), supported by FAO, WFP, UNDP and other international agencies, listed a number of measures (177 in total) which were taken to improve the country's food security. It addressed four targets ensuring: food availability; physical and economic accessibility of food; quality, variety and caloric intake; control and supervision of food safety. According to information from MAWRRD, the programme achieved 98.9 percent of all of the planned measures. The remaining activities were not implemented due to financial constraints and were included in the more recent Food Security and Nutrition Program for 2019–2023 (GKR, 2019a). However, specialists still noted a low level of management, poor control, and a lack of responsibility for the implementation of the programme's activities.

The situation in the country in terms of ensuring availability, access, consumption and stability of food remains very difficult. Considering the high priority of food security and nutrition for the country, the government decided to develop the Food Security and Nutrition Program for 2019–2023 (FSNP). The FSNP was adopted by the Government Decree No. 320 of 27 June 2019. The strategic goal of FSNP is a qualitative improvement in the nutrition of the population by ensuring the availability, accessibility, and safety of food. The degree of achievement of the goals by 2023 is determined by a system of monitoring and evaluation indicators specified in a matrix of indicators. The five priority policy directions for achieving the strategic goal are (GKR, 2019a):

1. improving the availability of food for consumption by the population;
2. ensuring the availability of food for the population;
3. improving the nutritional status of the population;
4. enhance food safety;
5. formation of an effective system of management, monitoring and evaluation of the FSNP.

Regarding the early warning of a food crisis or food shocks, it is planned to change the monitoring and evaluation system through improving the traceability of availability of basic foods, through improving and supplementing the existing system of indicators; introduction of new indicators for monitoring and evaluating improvements in food quality and food safety; introduction of quantitative indicators disaggregated by sex, age, employment, social status and region; improved integration and synchronization with SDG indicators. The change is to some extent related to the accession of Kyrgyzstan to the Eurasian Economic Union (EAEU).

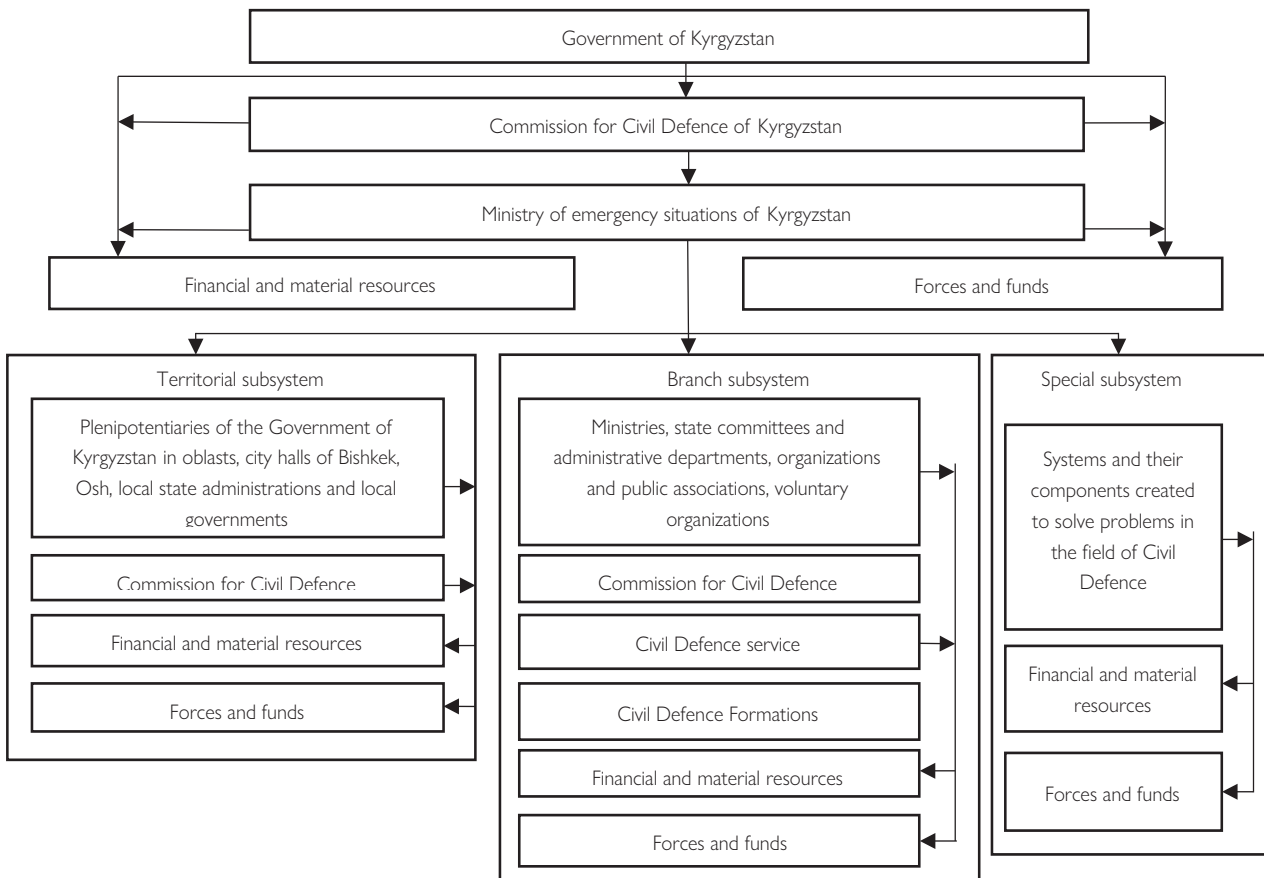
Strengthening the EWS in food security is also linked to food safety. The solution for this is through the improvement of the system to fulfil the requirements of the EAEU technical regulations at each stage of food production and sale, and by increasing the effectiveness of an integrated unified traceability system for the safety of animal and vegetable products in compliance with FAO standards, as well as WHO and World Organisation for Animal Health guidelines. The electronic mapping of outbreaks of harmful, especially dangerous pests and quarantine objects, and especially dangerous infectious animal diseases, as well as cattle burials, will also be introduced.

# Institutional framework

## Roles and responsibilities of authorities involved in disaster risk reduction activities

In Kyrgyzstan, the State Civil Protection System (SCPS) is responsible for governing state bodies, local governments, public associations, and voluntary organizations. The SCPS protects the population and the territory during emergencies that may occur in peace time and wartime. Figure 6 provides an overview of the institutional structure of the SCPS. The SCPS is based on the territorial–sectoral principle, taking into account, economic, natural, as well as demographic, gender, and cultural characteristics of various groups of the population, characteristics of territories, and the extent of emergencies. The planning, organization and management of civil-protection activities is carried out by the Ministry of Emergency Situations (MES). The SCPS consists of a territorial sub-system created on the basis of administrative territorial units, a branch sub-system created on the basis of ministries, state committees and administrative departments, and a special sub-system created to solve problems in the field of civil protection.

Figure 6. Management structure of the State Civil Protection System



Source: Based on the resolution of the Government of Kyrgyzstan On approval of the Regulations on the State Civil Protection System, dated 18 April 2019, No. 179.

The Interdepartmental Commission for Civil Protection (ICCP) (GKR, 2010) is the coordinating body on the republican level of the State Civil Defence System. The ICCP is headed by the prime minister, who is the head of civil protection for the country, and chairperson of the commission. The first vice-prime minister is the first deputy chairperson of the ICCP, while the minister of emergency situations is the deputy chairperson. The composition of the ICCP includes heads of executive bodies, plenipotentiary representatives of the regional government, and mayors of the cities of Bishkek and Osh. The main functions of the ICCP include:

- managing the development and implementation of the development strategy of the SCPS and legal norms to ensure the protection of the population and the territory during emergencies;
- coordinating civil protection activities during peace time and wartime;
- organizing scientific and technical research and special programmes in the area of civil protection;
- forecasting and assessing the socioeconomic impacts of emergencies;
- solving issues related to financing urgent civil protection measures from state funds;
- ensuring the readiness of civil protection authorities, state bodies and local governments;
- determining the main directions of international cooperation in the area of civil protection;
- creating financial and material reserves for responding to emergencies.

MES is an authorised state executive body, implementing a unified state policy in the area of civil protection, fire, radiation safety, safety of people on water bodies, and hydrometeorology. The main tasks of MES are (GKR, 2012a):

- monitoring and forecasting hazardous natural, man-made processes and phenomena, planning activities in the area of civil protection, fire, radiation safety, safety of people at water bodies and hydrometeorology, training of management bodies, civil protection forces, and the public, to act in emergencies;
- implementing preventive, mitigation and preparedness measures to reduce the impact of emergencies;
- organizing and conducting search and rescue, emergency and restoration and other urgent work, reducing the impacts of emergencies, assessing their scale.

MES is also engaged in the monitoring and forecasting of hazards as well as developing EWS, which are carried out by MES structural units, including the Department of Monitoring and Forecasting of Emergency Situations (DMFES), Kyrgyzhydromet, the Agency for Tailings Management, the state fire service, operational department and department of protection of the population and territories, and department of the state agency *Selvodzashchita* (mud flow protection). Information exchange within the context of emergency management and emergency response is carried out by the Crisis Management Centre (CMC) and the Information and Analytical Department of the MES central office (MES, 2018c). The following departments and agencies are part of MES:

- MES departments in the regions, Bishkek and Osh cities
- Department of Monitoring and Forecasting of Emergency Situations (DMFES)
- Department of Emergency Prevention and Response
- Department of Capital Construction of Emergency Prevention and Response
- state agency *Selvodzashchita*
- military units (military unit No. 86123 – State Rescue Training Centre, military unit No. 81497 – republican separate rescue squad), rescue services
- Tailings Management Agency
- state enterprise Aviation Enterprise
- South Emergency Response Centre
- mechanized bases for emergency response (Issyk-Kul and Talas)
- state enterprise Northern Emergency Response Centre
- hydrometeorology agency Kyrgyzhydromet
- Centre for training and retraining of civil protection specialists
- MES diving service
- Crisis Management Centre (CMC).



## Roles, responsibilities and activities of Ministry of Agriculture, including hydromet services

The central executive authority responsible for ensuring the country's food security, development of agricultural production, and food industry, is the Ministry of Agriculture, Water Resources and Regional Development (MAWRRD). This was established in 2021 and is the successor to the Ministry of Agriculture, Food Industry and Land Reclamation (MAFILR). Currently, MAWRRD has identified a strategic goal and policy directions for ensuring food security and nutrition in Kyrgyzstan for the next five years. The MAWRRD central office includes the following departments which perform sectoral policy functions:

- agrarian policy and economic forecasting
- livestock development
- development of agriculture, seed production and organic agricultural production
- introduction of advanced technologies
- development of cooperation
- food and processing industry
- food security.

The main tasks of MAWRRD related to the reduction of risks of natural hazards are (GKR, 2019a):

- management of the development and implementation of measures for crop protection and crop production at agricultural facilities in emergency situations of a natural and man-made nature;
- threats and emergencies forecasting, as well as assessment of their impact on the phytosanitary situation in the country;
- organization and control of water supply to consumers, as well as ensuring the safety of hydraulic structures in emergency situations.

In the context of departments, before 2019 the responsibilities of the ministry were divided into three categories:

### **Department of Chemicalisation and Plant Protection**

- managing relations in the field of pesticide and agrochemicals management, plant protection;
- preventing emergencies in relation to the spread of especially dangerous non-quarantine pests;
- increasing the knowledge of rural producers in the field of plant protection, preservation and improvement of soil fertility, productivity and quality of crops.

### **Department of Plant Quarantine**

- formation and systematic updating of the system of quarantine phytosanitary measures;
- prevention of the invasion and spread of quarantine pests in the territory of Kyrgyzstan;
- prevention of damage from the spread of quarantine pests;
- ensuring compliance with international obligations in the field of quarantine.

The Department of Water Management and Land Reclamation, which in 2019 was transformed into the State Water Resources Agency, keeping more or less the same responsibilities (see Table 6).

To these tasks may be added the responsibilities of MAWRRD in the field of adaptation to the risks of climate change, the main objective being the improvement in the efficiency of land use and climate-change adaptation of the agricultural sector. The main measures include (GKR, 2017):

- optimization of location and specialisation of agricultural production;
- conducting breeding work on the cultivation of drought-tolerant and salt-tolerant crops;
- conducting revegetation works;
- integrated pasture management and development of pastoral livestock, taking into account adaptation to climate change;
- improving relevant agricultural infrastructure for better adaptation to climate change;
- improving food safety monitoring systems and creating a system for forecasting crop yields.

In Kyrgyzstan, there is a system in place that provides advisory services in agriculture. Currently, these responsibilities are assigned to the Ministry of Agriculture and its regional offices, as well as research organizations and educational institutions. At the local level, this function is performed by consultants in the regional administrations, partially the staff of the local administrations and institutions. In part, some consultancy work is conducted through international programmes and projects within the pilot territories. Organizations providing such services include:

- The Centre for Training, Consulting and Innovation public foundation provides educational, advisory and informational services in the field of agriculture to organizations whose work is aimed at overcoming poverty and raising living standards in rural areas.
- District agrarian development directorates (RUAR) are representative offices of MAWRRD located in 40 districts of Kyrgyzstan. They implement the policies of the ministry in the regions – they monitor, develop forecast indicators, give recommendations to farmers on sowing and watering, and are responsible for spring field work. They interact with local authorities on the improvement of veterinary services and pasture management.
- The state enterprise information marketing centre *Aiylmaalymat*, of MAWRRD. Its goal is the development and maintenance of information infrastructure in the agricultural industry through providing information and marketing services, as well as work on a contractual basis.
- The Rural Advisory Service is represented by five independent public foundations in five regions of Kyrgyzstan. They provide agricultural advisory services to farmers.
- The Community Development and Investment Agency operates in all 475 rural districts of the country, in all small and large cities of Kyrgyzstan, supporting a wide spectrum of the rural and urban population.
- The TES-Centre (training and counselling centre) is a Kyrgyz NGO whose goal is to increase the income of the population employed in agriculture through quality training and counselling. Training and counselling is conducted in the areas of growing crops and livestock based on advanced, practical technology.
- The public association AgroLid is an agricultural consulting company that helps improve the economic situation of agro-industrial sector participants through the construction and development of value chains in accordance with the green economy and adaptation to climate change.
- Training, information and consultation centre for the support of cooperatives at the Kyrgyz National Agrarian University (KNAU). The aim of the centre is to disseminate knowledge in the field of cooperation and agro-industrial integration, and increase the level of specialists, heads of cooperatives, agricultural producers, and local governments.
- The National Training Centre at KNAU on fruit crops and biodiversity provides training for farmers on horticulture, agrobiodiversity, and walnut growing.
- The World Overview of Conservation Approaches and Technologies network has partners in Central Asia, particularly the University of Central Asia and the KNAU. Technologies, including adaptation and mitigation to emergency risks and climate change, documented in the network's database, are distributed by the International Center for Agricultural Research in the Dry Areas, GIZ, FAO and several NGOs such as CAMP Alatau, Agrolid, rural advisory service, "Ayil Demi" (through regular publication of technologies in the newspaper).

The following organizations are involved in research in the field of agricultural emergency risk reduction:

- Kyrgyz Research Institute of Agriculture of the Ministry of Agriculture. The aim of the institute is to conduct research in the field of agriculture, soil science, agricultural chemistry and crop production to help solve the problems of food security of Kyrgyzstan (GKR, 2018e).
- Kyrgyz Research Institute of Livestock and Pastures of the Ministry of Agriculture, a subordinate of MAWRRD. Its aim is to conduct research in the field of animal husbandry, pastures and breeding of forage crops to help solve the problems of food security (GKR, 2018f).
- The Kyrgyz Research Institute of Veterinary Medicine focuses on the problems of protecting the health of animals, birds and bees, ensuring food, biological and environmental safety of the country.
- The Kyrgyz Research Institute of Irrigation conducts research in the field of irrigation technology.
- Kyrgyz National Agrarian University (KNAU).

These and other organizations are involved in disaster risk management activities in the fields of agriculture, water, and food security, through various platforms and programmes. Each organization, according to its profile, has obligations in the field of disaster management (Table 6).

Table 6. Responsibilities of organizations involved in disaster risk management activities in the fields of agriculture, water, and food security

Organization	Responsibilities (according to corresponding regulations)
Department of monitoring and forecasting of emergency situations of MES	<ul style="list-style-type: none"> <li>– monitoring, forecasting, warning of emergencies;</li> <li>– development and implementation of state programmes for the prevention of natural and man-made disasters to ensure protection of the population;</li> <li>– forecasts of potential hazardous natural processes and phenomena in the territory of Kyrgyzstan (MES, 2018d).</li> </ul>
Agency for Hydrometeorology under the State Committee on Ecology and Climate of the Kyrgyz Republic (Kyrgyzhydromet)	<ul style="list-style-type: none"> <li>– monitoring of natural environment to protect the population from hydrometeorological phenomena, prevent or reduce their damage;</li> <li>– forecasting of hazardous and natural hydrometeorological phenomena, publication of weather forecasts, data on river flow and water inflow into reservoirs, forecasts of avalanche danger, agrometeorological forecasts, forecasts of high and extremely high environmental pollution;</li> <li>– establishment and development of international cooperation in the field of hydrometeorology and related areas, as well as monitoring of environmental pollution and anti-avalanche safety;</li> <li>– meeting the needs of the population, state bodies and the economy in hydrometeorological information and information on environmental pollution, including hazardous hydrometeorological phenomena (MES, 2018e).</li> </ul>
State Committee for industry, energy and sub-soil use of the Kyrgyz Republic (SCIESU)	<ul style="list-style-type: none"> <li>– works on water supply issues through conducting hydrogeological, engineering-geological and other specialised works, studying the regime and condition of underground fresh and thermal-mineral waters, and dynamics of dangerous exogenous geological processes that threaten the population and industrial and social clusters (GKR, 2016b).</li> </ul>
State Committee on Ecology and Climate of the Kyrgyz Republic (SCEC)	<ul style="list-style-type: none"> <li>– implementation of policies and regulations in the field of environmental protection and use of natural resources, as well as accounting, assessment of the state of natural components and resources;</li> <li>– prevention of the impact of possible negative consequences of the implementation of the planned activities on the environment by conducting state environmental impact assessment;</li> <li>– establishment and development of international cooperation in the field of environmental protection, environmental safety and environmental management (GKR, 2012b).</li> </ul>
State Inspectorate for Veterinary and Phytosanitary Security (SIVPS)	<ul style="list-style-type: none"> <li>– prevention, detection and suppression of violations of legislation in the field of sanitation, veterinary medicine, phytosanitary measures and ensuring the safety of food products, products of plant and animal origin;</li> <li>– conducting state supervision over the observance of sanitary, veterinary and phytosanitary standards;</li> <li>– prevention of the import, export and spread of diseases common to humans and animals, and pests of plants (GKR, 2013a).</li> </ul>
State Inspectorate for Environmental and Technical Safety	<ul style="list-style-type: none"> <li>– state supervision and control over compliance with the requirements of regulatory legal acts, technical regulations on mechanical, seismic, fire, environmental, industrial, energy, biological, chemical and radiation safety in relation to products (objects) and/or related production, construction, installation, adjustment, operation, storage, transportation, use, sale, burials, placements and disposal (GKR, 2012c).</li> </ul>
Department of State Sanitary and Epidemiological Surveillance of the Ministry of Health of the Kyrgyz Republic	<ul style="list-style-type: none"> <li>– implementation of state policy in the field of sanitary and epidemiological well-being of the radiation safety of the population;</li> <li>– organization and implementation of state sanitary and epidemiological surveillance and service of the Kyrgyz Republic;</li> <li>– coordination of the activities of state bodies and economic entities on the issues of ensuring sanitary and epidemiological well-being of population;</li> <li>– sanitary and epidemiological regulation, improvement of legal regulation of public health issues in connection with the impact on people of adverse environmental factors and living conditions;</li> <li>– determination of priorities in the organization of research work on the provision of population's sanitary and epidemiological welfare (GKR, 1997).</li> </ul>
State Water Resources Agency under MAWRRD (SWRA)	<ul style="list-style-type: none"> <li>– implementation of integrated water resource management;</li> <li>– regulate relations in the area of water management and use;</li> <li>– ensure sustainable management and efficient use of water resources, water management infrastructure, water supply and sanitation facilities;</li> <li>– ensure efficient international cooperation in the area of water management and use (GKR, 2019c).</li> </ul>

Organization	Responsibilities (according to corresponding regulations)
Department of Chemicalisation and Plant Protection of MAWRRD	<ul style="list-style-type: none"> <li>– implementation in the prescribed manner of regulating relations in the field of handling pesticides and agrochemicals, plant protection;</li> <li>– prevention of the emergencies and spread of highly dangerous non-quarantine pests;</li> <li>– increasing the knowledge of rural producers in the field of plant protection, preservation and improvement of soil fertility, yield and quality of agricultural crops (GKR, 2016c).</li> </ul>
Department of Plant Quarantine of MAWRRD	<ul style="list-style-type: none"> <li>– formation and systematic updating of the system of quarantine phytosanitary measures;</li> <li>– prevention of penetration into the territory of Kyrgyzstan and spread of quarantine pests in the country;</li> <li>– preventing damage from the spread of quarantine pests;</li> <li>– ensuring the fulfilment of the obligations of the country in the field of quarantine (GKR, 2016d).</li> </ul>
Institute of Seismology of the National Academy of Sciences of the Kyrgyz Republic (IS of NAS KR)	<ul style="list-style-type: none"> <li>– seismic hazard assessment and multi-scale seismic zoning maps;</li> <li>– study of the seismic regime of Tien Shan and its relationship with the geodynamic features of the region;</li> <li>– forecast of seismic situation and mapping of earthquake-prone areas;</li> <li>– quantitative assessment of the parameters of the impact of earthquakes on soil and structures, assessment of the seismic degree;</li> <li>– development of practical recommendations for reducing damage from seismic disasters and improving seismic resistance of structures (NAS KR, 2020a).</li> </ul>
Institute of Water Problems and Hydropower NAS of KR (IWPH NAS of KR)	<ul style="list-style-type: none"> <li>– fundamental and applied scientific research on the patterns of river flow formation, assessment and forecasting of resources, regime and quality of surface, groundwater and soil water in conditions of climate change and human activity, assessment of the impact of climate change, regime of water bodies and water quality on the environment, aquatic ecosystems, development of scientific foundations for the protection of water resources, improvement of methods and models for the development and operation of water management systems (NAS KR, 2020b).</li> </ul>
Institute of Biology NAS KR (IB NAS KR)	<ul style="list-style-type: none"> <li>– monitoring of biodiversity of flora, fauna and soil under global changes and increasing anthropogenic pressures (NAS KR, 2020c).</li> </ul>
Institute of Geology, NAS KR (IG NAS KR)	<ul style="list-style-type: none"> <li>– geographical research on the integrated study of the spatial differentiation in the country, assessment of the state and direction of development of geosystems, identification of their resistance to various natural and anthropogenic influences, assessment of the environmental situation and development of a system of measures for the optimal use of the potentials of geosystems (NAS KR, 2020d).</li> </ul>
Institute of Geomechanics and Subsoil of the NAS KR, Geopribor Research Center	<ul style="list-style-type: none"> <li>– assessment, prediction and prevention of the consequences of natural and man-made disasters (through mathematical modelling, environmental risk assessment, creation of tools and equipment, studies assessing stability of tailings dams and hydrotechnical structures) (Institute of Geomechanics, 2020).</li> </ul>
Central Asian Institute for Applied Geosciences (CAIAG)	<ul style="list-style-type: none"> <li>– conducting multidisciplinary research and applied research on DRR, water management and adaptation to climate change in Central Asia for making science-based decisions;</li> <li>– development of new methods and achievement of scientific results that promote practical application in the field of DRR, and ensure the sustainable development of the region;</li> <li>– studying the processes of global and regional changes and their impact on the environment;</li> <li>– monitoring of dangerous natural processes and phenomena, assessment of multidisciplinary risks, reducing vulnerability to disasters;</li> <li>– applied research in the following areas: geodynamics and geohazards; climate, water, and geoecology; technical infrastructures and data management (CAIAG, 2020).</li> </ul>

## Existing coordination and information-sharing mechanisms

Kyrgyzstan has created a National Platform for Disaster Risk Reduction, 2011 (MES, 2011b) which is aimed at uniting and coordinating the disaster risk management efforts of all partners, including government agencies, academic institutions, public organizations, media, business, and international organizations. Its Secretariat was established to provide technical assistance to the Interdepartmental Commission on Civil Protection. To this end, expert groups were formed in 2013 (MES, 2013a), consisting of various structures involved in monitoring and forecasting geophysical, biosocial, climate, and technological hazards. Most of the studies conducted by these expert groups are related to research on the likelihood of occurrence, and impacts of disasters. Table 7 below lists different types of hazards and corresponding institutions responsible for managing and implementing various activities related to DRR and adaptation to climate change in agriculture.

Table 7. Institutions responsible for agriculture-related DRR activities according to hazard

Type of hazard	Structures/institutions
Earthquake	IS of NAS KR, CAIAG, DMFES
Mud flows and flooding	DMFES, Kyrgyzhydromet, IWPH NAS of KR, Joint stock company Kyrgyz head institute for engineering survey, SWRA, Geopribor Research Centre
Landslide	DMFES, CAIAG, Joint stock company Kyrgyz head institute for engineering survey, Geopribor Research Centre
Geocryological processes	Kyrgyz head institute for engineering survey
Underwater flooding	DMFES, Kyrgyz head institute for engineering survey, IWPH NAS of KR, SCIESU, SWRA
Desertification, salinisation, erosion lands	IB NAS KR, SCEC, IWPH NAS of KR, State Design Institute for Land Management Kyrgyzgiprozem
Strong wind; heatwave	Kyrgyzhydromet
Long rains, heavy rain	Kyrgyzhydromet, MAWRRD
Heavy snow, blizzards; ice, frost; hail	Kyrgyzhydromet, MAWRRD
Soil drought	Kyrgyzhydromet, IB NAS KR, MAWRRD
Atmospheric drought	Kyrgyzhydromet, MAWRRD
Forest fires, mountain fires, fires of steppe and bread array	SCEC, CMC, Kyrgyzhydromet
High-altitude penetrating lakes	SCIESU, DMFES, Kyrgyz head institute for engineering survey, Kyrgyzhydromet
River erosion	DMFES, IWPH NAS of KR, CAIAG
Ground subsidence	DMFES, Kyrgyz head institute for engineering survey
Glacier degradation	IG NAS KR, Kyrgyzhydromet, CAIAG, SCEC
Breakthrough dams, locks, jumpers and other accidents on hydraulic structures	SWRA
Epizootics, mass damage to agricultural plants by pests, weeds and epiphytotics	MAWRRD, SIVPS

The State Committee on Ecology and Climate of the Kyrgyz Republic (SCEC) is the responsible executive body for the implementation of commitments under the UNFCCC and the Kyoto Protocol (GKR, 2006). The main function of the SCEC is the coordination of activities in the field of air protection, control of the production and consumption of substances that destroy the ozone layer, use and protection of water resources in terms of climate change, land, flora, fauna, fish stocks and their environment and habitats, protection of forests, activities in specially protected natural areas, treatment of production and consumption of waste, their transboundary movement, including radioactive waste (GKR, 2012b).

Before 2020, the Coordination Commission on Climate Change Issues (CCCCI) (GKR, 2012d), chaired by the vice prime minister of Kyrgyzstan, was the responsible coordination body for environmental issues. The CCCCCI was established to guide and coordinate the activities of ministries, departments and organizations to fulfil commitments under the UNFCCC and the Kyoto Protocol, aimed at stabilizing the concentration of GHG in the atmosphere at a level that would prevent a dangerous impact on the climate system. Decisions made by the CCCCCI were binding for all state executive bodies, as well as relevant enterprises, institutions and organizations.

On 30 January 2020, the Resolution of the Government of Kyrgyzstan No. 46 established a Coordinating Council on the development of a “green” economy and climate change. The Coordination Council has combined the functions of two pre-existing commissions (on climate change and on green economy) and is designed to provide integrated management of planning, coordination and implementation of measures on climate change and the development of a green economy in the country. The prime minister is the chair of the council (Climate Finance Center, 2020).

The country has also established the Council on Food Security and Nutrition (CFSN), which is an advisory body formed by the government. It is created to make operational decisions to ensure stable and uninterrupted supply of the country with food and improved measures in the area of healthy nutrition for the population. The CFSN’s chairperson is the first vice prime minister, and the deputies are the minister of agriculture, food industry and

land reclamation, and minister of health. The CFSN consists of the heads of a number of ministries, agencies and departments of the government office. The main activity of the CFSN is to develop proposals for:

- strategic directions for food security and improving the quality and safety of food products;
- implementation of decisions of the government on issues of food security and nutrition;
- guidelines, annual programmes and long-term projections of food security and nutrition;
- improving financial and tax policies aimed at ensuring food security and nutrition;
- effective measures to protect rural producers;
- ensuring a competitive environment by ensuring access to the food market for the goods of all types of owners;
- prevent the reduction of the achieved level of food security;
- organizing regular monitoring of the implementation of measures in the field of healthy nutrition;
- measures to prevent threats to the food security of the country associated with changes in foreign and domestic food markets.

The Climate Dialogue Platform (CDP) was created as an initiative of the State Agency for Environmental Protection and Forestry. It is a partnership of government institutions, research centres, educational institutions, NGOs, business, and the media. Its goal is to support joint activities related to climate-change adaptation, mitigation of its effects, increase capacity, knowledge and awareness, allowing a consultative working format for joint problem solving. The platform is designed to provide a multidisciplinary and comprehensive regular exchange of information, knowledge and experience among various participants in climate-change adaptation management. The objectives of the CDP are to:

- Inform partners on the implementation of national commitments under the UNFCCC.
- Ensure communication on all ongoing and planned joint actions at national and regional levels.
- Address feedback from civil society and develop recommendations;
- Facilitate interaction and information sharing between civil organizations, government agencies and development partners;
- Popularisation and dissemination among the public of the results of scientific research and technologies in the field of climate change (SCEC, 2020a).

Similarly, the Climate Change Center of Kyrgyzstan (CCC) was established as the initiative of the State Agency for Environmental Protection and Forestry. The purpose of the CCC is to assist the country in fulfilling its international obligations and national measures in the field of climate change. As this organization is a donor-oriented NGO, financial constraints remain one of the main challenges, halting its work, as it depends on financial support through international projects. The main activities of the CCC include (SCEC, 2020b):

- building national capacities in addressing climate-change consequences;
- participation in the coordination and monitoring of actions taken in the field of climate change;
- development and participation in the implementation of concepts, programmes and action plans in the field of climate change;
- organization and implementation of scientific and methodological research and engineering works on adaptation and mitigation of climate-change risks;
- support of authorities in the development of relevant legislative and regulatory documents;
- participation in the activities of the Coordination Commission on Climate Change (CCCC);
- associations, organizational and thematic structures;
- organization of conferences, seminars and training on climate-change issues;
- participation in international information exchange.

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## Current gaps, limitations, challenges, constraints, opportunities

National activities in the field of risk management of agricultural disasters is mainly aimed at ensuring current activities and the allocation of state support resources for the respective sectors. Governing institutions do cover all the necessary areas of activity, but the potential of each of them is low due to limited funding. There is not enough highly qualified personnel. Systemic problems have accumulated over the years, and some reform is required. There is a clear lack of coordination between sectors, while cross-sectoral issues are not recognised

in policy and strategic sectoral planning. Coordination mechanisms between agency officials currently do not support the integration of agricultural DRR practices and approaches. Insufficient synergy, cooperation and coordination between the institutions involved, both horizontally and vertically, reduces the effectiveness of comprehensive actions to reduce the risks of agricultural disasters.

There is practically no mechanism for the interaction of Kyrgyzhydromet with MAWRRD, and the State Agency for Local Government and Interethnic Relations, to reduce disaster risks to agriculture and the environment, and as a result, farmers and other agricultural producers do not have access to timely forecast information. While information for general purposes (weather forecast, emergency information, information on air and surface water pollution) is provided by Kyrgyzhydromet for free, specialised meteorological, agrometeorological and hydrological information is provided for a fee, in accordance with government resolution No. 85 dated 10 February. Provided services cover, for instance, soil temperature, phenological observations, agrometeorological (decade agrometeorological bulletin, expected state of winter crops, etc.), meteorological, and hydrological forecasts (Antimonopolia, 2016). The efforts and capacities of local institutions responsible for the use of land and water resources, such as water user associations, pasture committees, rural public associations of consumers of drinking water, and *aiyl okmotu* employees, among others, are not enough to reduce the risks of agricultural disasters. An integrated approach to land management at the level of water basins is needed. However, this is not practised in the country at the current time.

Despite the efforts of national governments and international donors in mobilising financial resources to reduce agricultural disaster risks, the issue remains problematic. There is insufficient financial and legal support for the implementation and coordination of the agencies responsible for such activities. Material resources and mechanisms for providing technical support for organizational strengthening are limited. A barrier also arises from the fact that the economic benefits from implementing preventive measures are not clearly visible, which could limit potential financial investments, since currently in the case of disasters, only direct damage indicators are taken into account. An important problem is that mechanisms for the transfer of environmentally sound technologies that reduce the risks of agricultural disasters have not been developed yet, while the implementation of this process is not included in the strategic priorities of the state. There is no national technology transfer policy, no authority responsible for this process, and no financial mechanisms in place.

Another problem is related to the provision of qualified specialists to the industry. Of the total number of university graduates across the country, only 1 percent (about 300 people) focus on agricultural studies, and less than half of them end up working in the field. The lack of qualified specialists and weak institutional facilities (specialised software, equipment, methods, statistical, hydrological, cartographic databases, and so on), as well as the limited exchange of data between institutions, constrain the possibilities for assessing, planning and implementing activities focused on DRR in the agricultural sector. There is also great potential for the implementation of geographical information systems (GIS) for data processing and analysis; however, specialists in the field of agriculture do not know it well enough. A number of institutes own databases of statistical, cartographic, or hydrometeorological data, but access to them is limited, and there is limited analytical information that interprets data for use (even internally). As a rule, organizations that own such databases lack the capacity to analyse them properly, while scientific institutions do not have full access to data.

While Kyrgyzstan has a network of scientific, design and educational institutions that have some expert potential, especially in terms of conservation technologies, new varieties, animal breeds and planting stock, there is a problem related to the support of the country's scientific community. According to experts, the country's research and academic institutions are in crisis, including in the field of agricultural science. Only 7 percent to 8 percent of all investments in science are allocated to agricultural research in the country – about KGS 30 million (USD 434 782). These funds are only enough to pay salaries. As a result, there is a lack of research projects, the practical absence of young specialists entering the field, and outdated agricultural technologies that are not adapted to reality. Today we have a situation where science and education exist mainly in isolation from each other, which has caused stagnation in science and degradation in the higher education system. The scientific community in Kyrgyzstan has extremely weak ties with the global scientific community; there is a lack of understanding of the importance of science for development, the funding mechanisms are outdated, highly qualified personnel continue to leave the field, while material and equipment have become obsolete (GKR, 2013b).

# Early warning systems

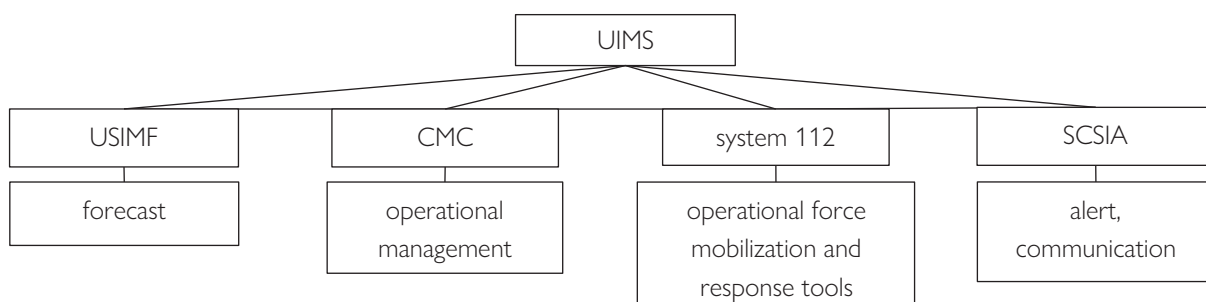
## Existing EWS services and products

In Kyrgyzstan, work is carried out systematically to develop and strengthen the SCPS according to the concept of DRR. One of the priorities of this work is to strengthen EWS for natural hazards across all sectors of the economy, covering possible environmental consequences and taking climate change into account. The Concept of Integrated Protection of the Population and the Territory of the Kyrgyz Republic from Emergencies for 2018–2030 prioritized measures to increase the effectiveness of the system for monitoring and forecasting emergencies and developing an automated management system, and alerting a unified information management system in emergency and crisis situations (GKR, 2018j).

The Department of Monitoring and Forecasting of Emergencies of the Ministry of Emergency Situations (DMFES) is the key national disaster risk management institute involved in the monitoring and forecasting dangerous endogenous and exogenous natural processes that threaten not only urbanized areas, but also rural communities and agricultural infrastructure. In order to create a comprehensive functional automated EWS in the country, the Unified Information Management System for Forecasting, Early Warning, Prevention and Elimination of Consequences of Emergency and Crisis Situations (UIMS) was established. It consists of four main components (Figure 7):

- Crisis management centres (CMC) are the day-to-day management bodies of the UIMS and are intended to combine information resources and capabilities of functional and territorial sub-systems of the SCPS for operational management in crisis and emergency situations (MES, 2018f). Full coverage is provided by the network of CMC regional centres, Bishkek and Osh cities;
- The state-wide comprehensive system of informing and alerting the public (SCSIA) is an organizational and technical framework of communication and alert forces, broadcasting networks, public use network channels, and departmental communication networks that provide information and warning signals (GKR, 2011). Coverage is provided at national level and at the level of four regions – Batken, Jalal-Abad, Osh, and Talas;
- The unified duty dispatch service (system 112) provides receiving and transmitting control signals, receives emergency messages from the public and organizations, ensures prompt response and coordination of joint actions of the departmental duty and dispatch services (MES, 2018g). Full coverage of the cities of Bishkek, Osh, Jalal-Abad, Talas, and Karakol, as well as Batken and Osh regions, and Issyk-Kul and Toktogul districts, is provided.
- The Unified System for Integrated Monitoring and Forecasting of Emergencies (USIMF) is intended for data collection and analysis, development of generalised forecasts of various emergencies and presentation of the results to state authorities, organizations, and the population.

Figure 7. Components of the UIMS and their main tasks



Source: MES, 2020.



Alerts within the framework of the UIMS are carried out through telephone and SMS alert managers; SMS alert of a storm warning through mobile operators; automatic activation of street sound sirens; informing the public by intercepting television broadcasting; public awareness by intercepting radio; public information points in places of mass gatherings; mobile points of information and public information. Also, the CMC with the support from WFP, the World Bank and UNDP, developed a mobile application, “112 Kyrgyzstan”, which allows users to receive urgent information about weather conditions, storm warnings, and recommendations for action during various types of emergencies (including storms, forest fires, drought) and first aid. This application also allows users to send messages about emergency situations, and attach photos, videos, and audio material.

The priority task of the SCPS related to early warning is the further development and strengthening of UIMS structures, as well as the integration of existing and newly created systems for monitoring, analysis and assessment of the disaster risks, and ensuring communication between the state, scientific and other risk management institutions of the country. This is a task not only for MES, but for all participants of the SCPS.

Monitoring and analysis of the epizootic situation is carried out by MAWRRD (GKR, 2016e) and the State Inspectorate for Veterinary and Phytosanitary Security (SIVPS) (GKR, 2013a), with the involvement of private veterinary services, pasture committees, the laboratories of the Centers for Veterinary Diagnostics and Expertise, and the Kyrgyz Scientific Research Institute of Veterinary Medicine. In accordance with the plan for anti-epizootic measures, ten particularly dangerous zoonotic diseases are monitored out of 22 regulated animal diseases – the incomplete coverage is explained by insufficient funds. The Scientific Research Institute of Veterinary Medicine monitors random sampling for only two diseases – brucellosis and echinococcosis (Scientific Research Institute of Veterinary Medicine, 2014). Depending on the extent of the spread of animal disease, coordination of anti-epizootic activities is carried out by the emergency commissions at district and regional levels.

For the purpose of early warning of epizootics, the following important measures have been taken and are currently carried out:

- national strategies developed with the International Epizootic Bureau for the control of eight especially dangerous animal diseases;
- rules for zoning the country’s territory into epizootic zones with different statuses;
- three main zones for foot-and-mouth disease identified;
- organized domestic points of veterinary control;
- developed and approved technical specifications for each type of preparation purchased in accordance with the requirements of international standards;
- vaccines and diagnostics are being procured against the following nine priority animal diseases: foot-and-mouth disease, small ruminant plague, sheep and goat pox, brucellosis, anthrax, rabies, echinococcosis, tuberculosis, horse equine (corresponding drugs have International Epizootic Bureau laboratories compliance certificates);
- regulation on epizootic monitoring approved;
- work is underway to optimize the laboratory system;
- epidemiological units are annually exposed to natural foci of the plague, and dusting is conducted;
- further work is being done on animal identification.

The Department of Pasture, Livestock and Fisheries within MAWRRD carries out the ichthyopathological control and monitoring of the sanitary and epizootic state of reservoirs and ponds (GKR, 2016f). The department has a sectoral observational network. The Department of Plant Quarantine of MAWRRD carries out monitoring and analysis of phytosanitary risk (GKR 2016c). It should be noted that due to the lack of financial resources, according to the experts and managers of this department, monitoring of the phytosanitary situation is carried out with incomplete coverage – only 10 percent of the surveyed territory (GKR 2016c). When an epiphytotic threat occurs, information is received by the Department of Chemicalisation and Plant Protection of MAWRRD for subsequent phytosanitary quarantine measures (GKR 2016b). The State Water Resources Agency (former Department of Water Management and Land Reclamation of the MAWRRD) conducts monitoring and regulation of the use of water resources, irrigation and melioration infrastructure facilities, and develops and coordinates the implementation of measures to ensure the safety of dams and other water facilities (GKR, 2019c).

The main problems of early warning of epiphytotics and epizootics and some recommendations to overcome them are the following:

- The functioning in the agricultural sector of two state structures: MAWRRD – the authorised state executive body that implements state policy in the field of the agro-industrial complex; and the SIVPS under the GKR – the state executive body exercising authority in the field of veterinary and phytosanitary security. This situation creates conditions for duplication of efforts in the early warning of epizootics and epiphytotics. It is necessary to clearly divide powers, responsibilities, define functions of each organization, develop effective cooperation in the sphere of prevention, response, and information exchange.
- A lack of regulations for early warning and field response at district and *aiyl okmotu* levels, with the distribution of the functional responsibilities of disaster risk management actors at the local level, taking into account the principles of multi-stakeholder and multi-risk approaches. In this regard, it is advisable to consider the development of SOPs based on the practice of international institutions, primarily FAO.
- Poor level of communication between *aiyl okmotus* and farmers on one side, and relevant institutions on the other, with regard to early warning of disasters in agriculture. *Aiyl okmotus* and farmers in this collaboration act more as beneficiaries and not as equal partners. It is necessary to define a list of measures for the prevention of epizootic and epiphytotic diseases that are mandatory for local governments and owners of the farms, including the support to state institutions in the implementation of early warning and response activities.
- A low level of knowledge among farmers on measures to prevent epizootics and epiphytotics. Today, work to increase the knowledge of farmers is not carried out systematically, but through individual, non-related activities, without monitoring and evaluation of effectiveness. It is necessary to develop a unified policy on informing and training farmers in the basics of agriculture and livestock management. This should consider various aspects of disaster risk management and the wide participation of partners, including media, business communities, NGOs, educational and research institutions.
- There is often no interaction between institutions and structures that transmit forecast materials and disaster risk management participants whose functional responsibility is to make decisions on response. This can lead to disruptions in EWS, namely at the “alert” and “response” stages. It is necessary to consider the development of SOPs for receiving storm warnings or any other forecast of specialised institutions and agencies. For task forces, it is critical to transfer systematically information among institutions.

Monitoring and assessment of agricultural land is carried out by the structural units of MAWRRD – the State Design Institute for Land Management (Kyrgyzgiprozem) and the Department of Pasture, Livestock and Fisheries (GKR, 2012e). Kyrgyzgiprozem makes an inventory of land, including pastures. The Kyrgyzgiprozem GIS department compiles electronic maps on district and *aiyl aimak* level of agricultural land and pastures.

The monitoring of food security is assigned to the food safety unit of MAWRRD. This small unit acts as a secretariat for the Council on Food Security and Nutrition (CFSN). The results of the work are published on MAWRRD’s website; some general information is also published by the NSC (consumer price index).<sup>9</sup> Some of the main functions of the unit are (MAWRRD, 2020):

- analysis of the state of the domestic food market for the main food items;
- preparation of estimates of the food balance taking into account the food basket and proposals for the prevention of food crises, improving the situation in the domestic food market;
- preparation of proposals for the formation of annual forecast indicators of production relative to the average physiological needs of the population;
- quarterly monitoring and a set of information on the implementation of the Law of the Kyrgyz Republic on Food Security;
- collection and analysis of the information on the production and marketing of agricultural products and processing industry.

<sup>9</sup>More on the availability of food price information can be found in the section ‘Market information systems’.

The Environmental Monitoring Department of the State Committee on Ecology and Climate of the Kyrgyz Republic (SCEC) conducts monitoring and assessment of the environment in order to provide government bodies, and economic entities, with information on actual changes in the state of the environment, and the causes of these changes, in order to prevent and reduce damage (SCEC, 2020a). The State Agency for Environmental Protection and Forestry is responsible for monitoring the state of forest land and implementing measures for forest management, protection, use and reproduction of forest resources, protection of forests from fires, pests, diseases, unauthorised cuttings, and other actions harmful to forest land.

At the intergovernmental level, the Center for Emergency Situations and Disaster Risk Reduction (CESDRR) in Almaty has been established, based on the agreement between the governments of Kazakhstan and Kyrgyzstan (CESDRR, 2016). The strategic activities of this organization focus on strengthening joint activities of relevant country institutions in disaster risk management based on monitoring and assessing the underlying risk factors of disasters, improving EWS, and assisting in the establishment of regional EWS and mutual notification of the risk of emergency situations. The following initiatives in these areas should be noted:

- planned regional information and communication system for collection, processing, analysis, and transmission of emergency information and a regional web platform for emergency situations (based on the official website cesdrr.org);
- regional training – ‘Monitoring systems, early warning, GIS technology in the field of DRR’ – for employees of state bodies in Central Asia, with the help of trainers from the Asian Disaster Reduction Center;
- development of project proposals for the identification, assessment, mapping of large-scale, transboundary and multi-factor disasters;
- strengthening of systems for monitoring and forecasting emergencies;
- establishment of a regional large-scale and transboundary disasters EWS.

Another important institutional structure whose potential needs to be used to strengthen national EWS is the Disaster Response Coordination Unit (DRCU, 2008). The joint work of key representatives of ministries and agencies responsible for monitoring, forecasting, making decisions in early response with specialists from international organizations whose profile is disaster risk management will eliminate the gaps in EWS of national institutions. For example, Kyrgyzhydromet needs a methodology for predicting drought, hail and other meteorological risks; MAWRRD, the SCEC and many others need support in assessing damage and needs; MAWRRD in monitoring and evaluating food safety; state institutions and private insurance companies in helping promoting disaster insurance, which is an essential element of disaster prevention at the country level. In this regard, regular joint command and staff exercises with the development of aspects of early warning at all stages, and thematic working meetings, is extremely important.

The existing system of monitoring and prediction of disaster risks is currently characterised by the absence of:

- fully functional automated monitoring systems of natural and man-made emergencies;
- a unified system of integrated monitoring and forecasting of natural and man-made emergencies;
- regulatory framework with a clear distribution of powers, duties, tasks and functions between the participants of disaster risk management in the field of monitoring and forecasting natural and man-made emergencies;
- regulations for information interaction between ministries, departments and scientific centres in the field of monitoring and forecasting emergencies;
- uniform standards and approaches in the field of application of geo-information technologies.

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## Hazard mapping and GIS capacities

The priority in the national EWS is to strengthen integrated monitoring and forecasting of dangerous natural processes, taking into account the use of geographic information technologies and remote sensing, as well as the development of information systems. An example of a fully functional information system in the context of a generally accepted definition is the state-wide comprehensive system of informing and alert the public (SCSIA) of MES. Similar in general structure, the information system is implemented by the State Water Resources Agency – it is a digital information network on water, which will consist of a number of related databases,

including the state water cadastre, passports of irrigation systems, information on water user associations and water supply data, as well as a geospatial database for the maps (GKR, 1995).

Some of the disaster risk management institutions that use mapping and GIS capabilities, as well as organizations that have a cartographic database for use in DRR and early warning, are:

- CMC, DMFES and Kyrgyzhydromet MES KR;
- Kyrgyzgiprozem within MAWRRD;
- SWRA (the website contains maps in the section “featured maps and apps”);
- SCEC (cartographic data for CC, centralized database of maps – Integrated Forest Ecosystem Management project);
- CAIAG (department “Monitoring and data management systems”);
- Institute of Seismology of the NAS KR;
- The State Cartographic and Geodesic Service of the State Committee for Industry, Energy and Subsoil Use of the Kyrgyz Republic (SCIESU);
- State Registration Service (Gosregistr).

The CAIAG geodata platform (CAIAG GP) is intended for the collection, storage and dissemination of data and material necessary for the implementation of various work in the field of GIS and the processing of Earth remote-sensing data. The geodata platform will store raster and vector maps, satellite and radar data, digital terrain models with geographic location, as well as text, tabular and multimedia data that can be useful when performing GIS work and processing of remote-sensing data. It is also possible to set display styles in the geodata platform with the internal style editor and documented in the SLD (Styled Layer Descriptor) format, which can be imported or exported for use in external GIS programmes (CAIAG, 2020).

Most organizations provide maps for a fee. Some maps are freely available on websites, but as pictures, without the possibility of changing or finalising them. There are practically no maps of zoning of the territory according to the degree of disaster risk, with descriptions of permissible land uses and their limitations. Such maps are particularly badly needed for rural communities.

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## Market information systems

On the website of MES (<http://ru.mes.kg>) and the National Platform for DRR (<http://npdrr.kg>) there are sections that have great practical significance – the ‘update’ section, which provides operational information on the situation in the country, ‘system 112’, which provides recommendations on safety rules, and ‘publications’ – “Monitoring and forecasting of hazardous natural processes and phenomena in the Kyrgyz Republic” with analytical and forecast data and about the results of joint projects.

It is currently planned to update the MAWRRD website with the assistance of international organizations, in particular FAO. It is important that the new version meets the needs of the population and main users – farmers, who are interested in practical issues related primarily to ensuring the profit of their business. Farmers are worried about issues such as: what financial, technical resources can be used; which type of products are in most demand, how and where to sell them profitably; what are the threats and how to avoid them; what prices are expected; where you can buy seeds and pedigree cattle. Private information structures available in the country are ahead of the websites of state structures and are more in demand.

Each month the Ministry of Economy publishes the bulletin ‘Information on the results of monitoring retail prices for basic food and non-food products in the markets of the Kyrgyz Republic’ (Ministry of Economics, 2020). Every quarter, the National Statistics Committee also publishes the ‘Kyrgyz Republic Food Security and Poverty Newsletter’, which contains an analysis of the food security situation in the country. It combines and classifies material on the availability of food, its production, indicators of access to food, data on its consumption per capita. The appendices provide an overview of hydrometeorological conditions in Kyrgyzstan (which is based on the data provided by Kyrgyzhydromet), information on average retail prices for food products, estimates of the food balance of basic food products, nutrition balance in the form of energy value, as well as food-safety indicators.

Agroportal of Kyrgyzstan (<http://agro.kg/>) is the country level web portal (non-profit project), which has an extensive database on various aspects of agriculture and provides consulting support to farmers (free of charge). For example, there is information on prices, terms of delivery on buying pedigree livestock, seeds, feed, equipment for dairy farms, medicines, greenhouses, biogas equipment, drip irrigation systems, and other technologies. The existence of such a web resource is a good example of how business structures can provide such services better than state institutions authorised to provide information support to farms. There are only a few business websites that assist farmers in accessing the market (such as Agroportal). In order to help farmers find the necessary information about the markets, they should conduct a content analysis of existing web resources and provide users with a list of resources that provide complete and reliable information about the food market, agricultural commodity, land, labour, material and technical services, investments, information and scientific support. Such a list should be available on the website of MAWRRD.

FAO supported Kyrgyzstan in creating an agricultural market information system to provide statistical reporting on production and stocks of staple foods, and to ensure transparency of food markets. The project, supported by the Government of Turkey, focused on adapting the existing FAO Global Information and Early Warning System (GIEWS) food price tool at national level. Developed price monitoring tool is currently under the National Statistical Committee of Kyrgyzstan. However, the consistency of monthly data provided through this online tool deteriorated over recent years. Regarding the EWS of price changes, the Technical Working Group on Price Monitoring for Food Security was created in 2016, the chair of which is the Ministry of Economy. Other participants in the working group include the Ministry of Agriculture, National Bank, National Statistics Committee, and National Institute for Strategic Studies. Technical support was provided by WFP and FAO. The group issued several newsletters that provided timely information and price analysis on the main types of food and non-food products in the country's markets, as well as information on prices in world markets. The newsletter also provides information for early warning of food price increases (Ministry of Economics, 2016). Unfortunately, the release of newsletters with forecasts was limited to one year (2016). Currently, newsletters provide only monitoring information, published every day on the NSC website (<http://www.stat.kg/ru/daily-prices/>).

In February 1998, the Government of Kyrgyzstan adopted a Resolution on measures to create the Kyrgyz Agriculture Market Information System (KAMIS). Its goal was to provide producers, processors and consumers of agricultural products with reliable, regular and timely market information on the main types of crops, animals, poultry and material and technical resources, as well as to ensure market transparency and strengthen the export potential of the country. Branches were created at the regional level, and the state-run mass media were to ensure weekly dissemination of information at national, regional and district levels. The creation of the Kyrgyz Agricultural Market Information System was supported by the World Bank and it was supposed to start working in 2020. The idea of creating the Republican Agricultural Information System is to develop a software product in the agricultural system that allows the receiving of statistical information online from Uzbekistan and structural divisions of MAWRRD with further processing of information in order to meet the information needs of users.

The main users of the information system should be farmers, processors of agricultural products, industry associations, the central apparatus, subordinate and territorial units of the ministry. The Republican Agricultural Information System would consist of four modules: agriculture; livestock; processing industry and food security; agricultural policy. It would provide information on national, regional, district, *aiyl okmotu* level, for months, years, etc. The idea of the system is that the district agrarian development directorates will send reports to the ministry via internet, namely to the server of the Resource Analytical Center, where the information will be compiled and analysed. The idea was supported by GIZ, but unfortunately it has been suspended due to a lack of financial resources, qualified specialists, and the interest of the ministry itself.

Thus, regarding the monitoring of market prices and the availability of basic products, the situation in the republic is more or less fine. An analysis of global trends, and a connection with emergencies in the agricultural sector, is needed, to provide a price forecast and early warning. There is experience in the country (in terms of training) with the GIEWS, as well as with the UN-WFP Price Jumps Prevention (ALPS) tool to analyse observed price deviations and forecast seasonal prices in the framework of projects. This experience should be introduced into the existing information systems.

## Climate information systems

The department of agrometeorology and agrometeorological forecasts compiles decadal agrometeorological bulletins which include summarised information over the last ten days of the month on temperature and air humidity, temperature and soil moisture. The bulletin provides a forecast of the expected flowering dates and other phases of crop development, seasonal reviews, predictions of yield and gross harvest of grain and cotton (however, bulletins are provided only for a fee). The newsletter is sent by email to divisions of the Ministry of Agriculture, but no feedback from users is collected. No assessment of the consumers, agricultural organizations, was done, to clarify what information they need and in what timeframe they need it for conducting economic activities. An assessment of “last-mile” needs and preferences, in terms of agrometeorological services, is key for increasing the uptake of information. Working with consumers, primarily with local authorities and government, state enterprises, the commercial sector and the media to provide hydrometeorological information, practically comes down to transmitting forecasts and warnings without feedback.

Table 8 below illustrates existing gaps in the agrometeorological monitoring conducted by Kyrgyzhydromet. At the same time, it is worth noting that a project that is currently being implemented by the World Bank (Central Asia Hydrometeorology Modernization Project) will help to bridge some of the gaps highlighted in the table. Component B of the project is focusing specifically on strengthening the country’s hydromet services through improving infrastructure, capacity-development activities, revision of the methodological basis of operations, and development of forecasting systems.

Thus, a number of hazardous meteorological phenomena are still not covered by the Kyrgyzhydromet observation network, and in order to reduce the risks of disasters in agriculture, it is necessary to develop a system of urgent measures for organizing agrometeorological monitoring of drought, dry hot weather, hail, ice, and heavy fog. It is also extremely important to develop and implement a system of interdepartmental cooperation on early warning and response to the occurrence of the threat of dangerous meteorological phenomena, and the associated risks (secondary floods, landslides, rising groundwater levels, fires, epizootics and epiphytotics). To date, storm warnings do not have an adequate response in the activities of structures responsible for reducing the risks of disasters in agriculture, primarily in the work of the Ministry of Agriculture, district state administrations and the *aiyl okmotu*.

The disaster risk data platform of Kyrgyzstan developed by CAIAG is designed to build capacities and support adoption of effective and efficient decisions on disaster risk management in Kyrgyzstan. The platform is the main place to store, search, disseminate, display, enter and analyse data aimed at reducing risk and mitigating the consequences of natural hazard-induced disasters, providing various levels of government, the private sector and the public with more complete information and tools with which they can reasonably make decisions.

The sensory data storage system (SDSS) (<http://sdss.caiag.kg>) is a storage in the form of a database containing data from the sensors of measuring stations. The SDSS was developed as part of the Water in Central Asia (CAWa) project, and system maintenance and data support are funded by CAIAG. Most data in the SDSS is freely available. Any user without registration can go to the site, find the necessary time series on the map or in the table, display them in the form of a graph and save the data in graphical or digital form to their computer. The SDSS database contains hydro and meteorological data from all stations installed on CAWa projects, the Global Changes Observatory, and others (CAIAG, 2020).

Table 8. Matrix of forecasting meteorological risks in Kyrgyzhydromet and related gaps

Forecast	Institution / performer	Resource	Model / technique	Availability of specialists / workstation	Comments
<b>strong wind</b>					
From 12 hours to 5 days, wind speed	DMF, DA	German Meteorological Service	COSMO-CA	no	need a software calculator, it is necessary to install and adapt COSMO-CA, specialist training
<b>heavy dust / sand / storm</b>					
no	DMF, DA	no	no	no	need to be implemented
<b>long / heavy rain / rain with snow / heavy snow</b>					
From 3 to 5 days, intensity	DMF, DA	ECMWF, JMA	WRFAR <sup>10</sup> (local model)	yes	consider licensing costs when planning a budget
<b>snowstorm</b>					
background forecast only	DMF	no	no	no	need to be implemented
<b>ice-crusted ground</b>					
background forecast	DMF, DA	no	no	no	need to be implemented
<b>hail</b>					
no	DMF, DA	no	no	no	need to be implemented
<b>heavy fog</b>					
no	DMF	no	no	no	need to be implemented
<b>frost, severe frost</b>					
from 3 to 5 days	DMF, DA	–	Fedotova-Timoshenko method	yes	–
<b>sleet</b>					
from 3 to 5 days	DMF			yes	–
<b>soil drought, atmospheric drought, dry wind</b>					
no	DMF, DA	no	no	no	need to be implemented
<b>heatwave</b>					
from 3 to 5 days	DMF, DA	–	–	yes	–
<b>forest fires, mountain fires, fires of steppe and grain massifs</b>					
from 3 to 5 days	DMF, DA	–	Nesterov method "fire danger"	yes	update of the method is necessary, there is no feedback from the service user

Source: personal communication with Kyrgyzhydromet specialists.

<sup>10</sup>The Weather Research and Forecasting Model.

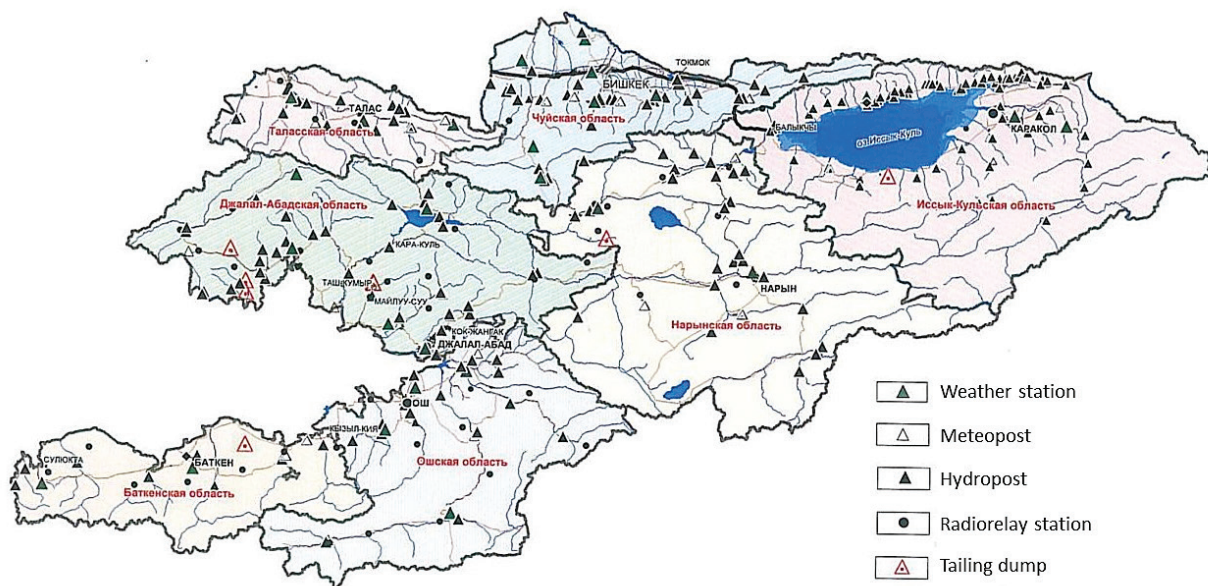
# Agrometeorology services

## Agrometeorological infrastructure

In Kyrgyzstan, a unified state policy in the field of hydrometeorological safety is implemented by Kyrgyzhydromet, the agency for hydrometeorology, which is a subordinate unit of MES. The Kyrgyz hydrometeorological network consists of (Figure 8):

- 56 automatic weather stations;
- ten agrometeorological posts;
- three specialised snow avalanche stations;
- six integrated hydrometeorological stations;
- four regional hydrometeorological centres;
- lake observatory on Issyk-Kul;
- 78 river hydrological posts;
- five lake hydrological posts;
- 15 observation points for environmental pollution.

Figure 8. Map of the monitoring system of MES KR



NOTE: The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

Source: MES, 2015.

The functioning of the monitoring network is ensured by the Department of the State Observation System of Kyrgyzhydromet (stations and posts). All monitored information is transmitted in system mode from 92 observation points to the information collection centre of the Telecommunications and Information Technology Directorate. After the initial verification, the information is received by the hydrological forecasting, agro-forecasting, and meteorological forecasting departments of the Hydrometeorological Observatory, Forecasts and Information Provision (Hydrometeorological Centre) and the avalanche safety department. The departments carry out analytical work and produce forecast materials for a wide range of consumers, and in-line forecasting and timely issuance of storm warnings about hydrometeorological hazards.



Agrometeorological observations are carried out at 20 meteorological stations and ten agrometeorological posts. Ten of these monitoring points are located in high mountain areas, and pasture observations are carried out there. The basic principle of agrometeorological observations is the consistency (continuity in time and in space) of weather monitoring and of observations of the development, growth, and state of agricultural plants. The subject of agrometeorological observations are agrometeorological factors (growth, plant development, soil moisture, yield, as well as meteorological elements), temperature and humidity, precipitation, wind speed, dry wind and other parameters.

The technical potential of the Central Asian Institute for Applied Geosciences (CAIAG) and Kyrgyz-Russian Slavic University (KRSU) can be considered as part of the general country infrastructure of the hydrometeorological observation network. Hydrometeorological monitoring carried out at 11 permanent automatic stations (located in Russia, Tajikistan, and Uzbekistan) is an operational system for collecting and pre-processing meteorological and hydrological information at strictly defined time intervals, as well as transmissions via communication channels (satellite, GSM) and on site. They focus on glacier monitoring. This monitoring system allows real-time monitoring of necessary hydrometeorological parameters, such as temperature and humidity, wind speed and direction, amount of precipitation, soil temperature and humidity, and monitoring of solar radiation (CAIAG, 2020). The Department of Monitoring and Forecasting Emergencies of MES is currently coordinating activities to create a unified system of integrated monitoring and forecasting of emergencies (MES, 2018h), which should include the data from the hydrometeorological observations of CAIAG and KRSU in the general information flow.

The methods of conducting agrometeorological observations and processing the results are regulated by the instructions for hydrometeorological and agrometeorological stations and posts. In warm periods, phenological observations are carried out in the fields surrounding the station, as well as the measurements of the crop density, weed infestation, disease infestation, and plant damage, determined by adverse weather events (frost, dry wind, hail, etc.). In winter, the temperature of the soil is monitored at the depth of the tillering unit, the depth of soil freezing. The height and density of snow cover in the fields and gardens are measured, as well as the condition (viability) of the plants.

There are a number of issues related to further enhancement of agrometeorological services, which should include, first of all, strengthening the role of Kyrgyzhydromet in predicting climate and meteorological risks as part of reducing damage to agriculture from disasters, and ensuring food security. In other words, during the modernization of Kyrgyzhydromet, it is necessary to take into account that this institute is designed to serve equally both the civil protection sector and the agricultural and water management sectors. In this regard, it is very important to improve the mechanism of interaction between Kyrgyzhydromet and MAWRRD, SCEC, and the State Agency for Regional Development (SARD), on DRR in agriculture and the environment. The basis for achieving the effectiveness of this interaction is in reliable, timely, and hydrometeorological and agrometeorological forecast information available for farmers and other agricultural producers.

It should be noted that during the modernization of the observation network of Kyrgyzhydromet, which was carried out within the framework of international projects, agrometeorological stations were not upgraded. Currently, agrometeorological equipment and instruments are physically outdated, often cannot be repaired and require urgent replacement. Automatisations of the stations and provision of real-time data is essential for farmers, so that they have enough time to act. For prevention, decadal or monthly bulletins could be too late to take action. The technical condition of the agrometeorological observation network leads to a collapse in the production of agrometeorological products. At all 20 meteorological stations and ten agrometeorological posts that make up the Kyrgyzhydromet network, there is an acute shortage of equipment for determining soil moisture, and soil freezing and thawing.

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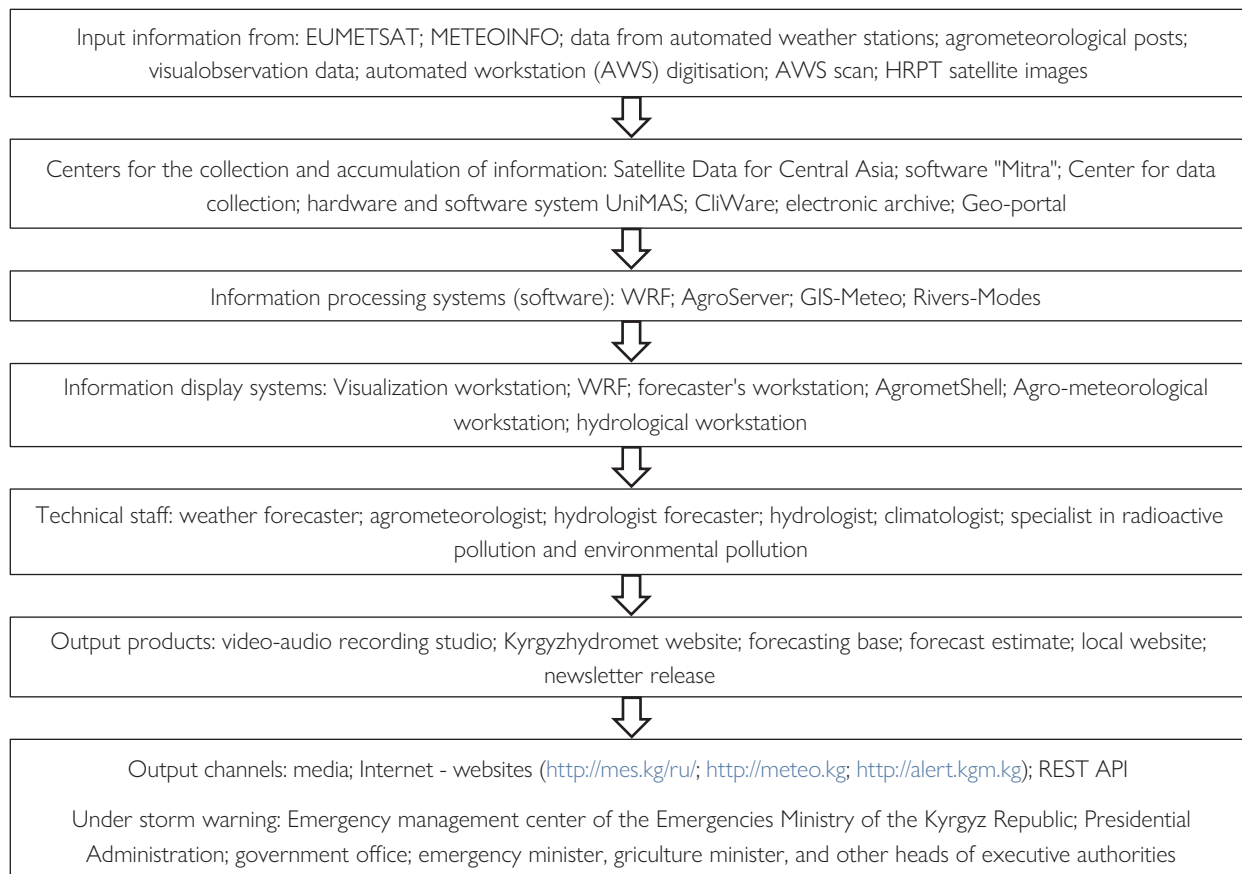
## Agrometeorology services and products for farm management

Weather forecast, storm warnings and agrometeorological bulletins are available on the Kyrgyzhydromet website, which is accessible to farmers. Kyrgyzhydromet provides public services in the form of specialised information – meteorological, hydrological, agrometeorological, and on background concentrations of pollutants in the atmosphere of cities and towns in Kyrgyzstan, on a contractual basis upon the request of individuals and legal entities for a fee (MES, 2018f).

The Department of Meteorology, Ecology and Environmental Protection of the KRSU has a meteorological centre which is equipped with a modern GIS-Meteo (Rosgidromet) processing, plotting and analysing programme, capable of developing daily weather forecasts for three days; and a hydrometeorological observatory, equipped with standard meteorological equipment, allowing to conduct operational meteorological observations (KRSU, 2020).

With the support of the World Bank, FAO, WFP and other international organizations, the country has developed a sustainable hydrometeorological and agrometeorological monitoring capacity and infrastructure, improved forecasting and improved efficiency of providing hydrometeorological information services to meet national economic and social needs, and reduce economic damage. The algorithm of actions for the collection, processing, and analysis of hydrometeorological and agrometeorological data, and release of forecast materials, is displayed in the diagram below (Figure 9).

Figure 9. The scheme of the information process in Kyrgyzhydromet



Source: MES, 2018f.

Currently, Kyrgyzhydromet does not have a database of agrometeorological data. For agrometeorological forecasts, statistical methods are used. Available baseline information is based on observations from stations and route surveys of crops. The method for predicting the yield of raw cotton is based on a combination of two forecasts – forecasting the yield trend calculated by the trend equation; and estimating deviations of the yield from the trend line depending on the agrometeorological conditions of the periods of development and formation of the crop. Specialised agrometeorological information is provided by Kyrgyzhydromet for a fee, in accordance with government resolution No. 85 of 10 February 2012. The agrometeorological forecasts include decadal agrometeorological bulletins; and monthly forecasts on the state of winter crops before winter, on the expected state of winter crops by the beginning of the growing season, on the expected moisture reserves by the beginning of the growing season, and on the expected yield and gross harvest of winter wheat (Antimonopolia, 2016). The AgrometShell software for crop yield forecasting is used in Kyrgyzhydromet. Meteorologists received computer equipment with appropriate software. A digital agrometeorological and agricultural statistical database has been developed, which is updated through existing and new weather stations installed in the Chuy and Jalal-Abad regions.

To enhance the uptake of climate services and agricultural advisories, services need to be tailored to user needs where technical weather, climate and agronomic information is translated into a more user-friendly language. The future modernization of Kyrgyzhydromet should consider how users, particularly farmers, prefer to receive information, and invest in producing information in that way.

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## Capacity-development efforts in agrometeorology services

Efforts to increase the capacity of the Kyrgyzhydromet agrometeorological service are related to the training, education and dissemination of information on agrometeorological topics. Such activities would accelerate the transfer of knowledge and methodologies, including research, coordination, communication and the user interface of relevant information services for the agricultural community. This target area also covers strengthening the ability of users to understand available agricultural meteorological products and services for better comprehension and proper use. At the same time, capacity-development efforts should not focus only on Kyrgyzhydromet, but also cover collaborations with other entities involved in agriculture, including the Ministry of Agriculture, academia, researchers and NGOs working with farmers.

The average age of Kyrgyzhydromet specialists is 40 to 45 years, while around 30 percent of its employees are more than 50 years old. The inflow of young specialists with a university degree is small, which is related to low wages. The main problem with Kyrgyzhydromet's personnel potential is the extremely low percentage of working specialists with special education. There is no clearly streamlined system of training, retraining and advanced training of personnel in a narrow specialisation (meteorologists, hydrologists, agrometeorologists, glaciologists, IT specialists, programmers, radiologists, metrologists, including mid-level observer specialists). It is necessary to implement a set of measures aimed at improving staff qualifications and training to ensure institutional strengthening, increase personnel and the financial stability of the national meteorological and hydrological services. Through participation in international projects, such as the World Meteorological Organization's (WMO) Voluntary Cooperation Program, Kyrgyzhydromet employees have improved their skills. The main emphasis in training was on the processing of meteorological and hydrological information. With the help of UNDP, the Agromet Shell programme has been installed in the agricultural forecasting department, which will make it possible to apply new methods for forecasting crop yields and hold a seminar for training specialists (World Bank, 2018b).

In 2018, within the framework of the World Bank project Modernization of Hydrometeorological Services in Central Asia, Kyrgyzhydromet's capacity was strengthened to create a stable observing infrastructure, improve forecasting and the efficiency of meteorological and hydrological information services in order to meet national economic and social needs. In January 2018, the Agency for Hydrometeorology received a license to conduct educational activities in the field of further education from the Ministry of Education and Science of the Kyrgyz Republic. The same year, in July, a training centre was opened in the city of Cholpon-Ata, on the basis of the lake observatory, as part of the same World Bank regional project. At the centre, employees undergo training on various topics – for example, on the production of weather observations (MES, 2018i).

At the same time, it is necessary to note the relatively high professional level of some of the specialists working in the departments of agrometeorological observations. For the most part, they can quickly master the implementation of modern technologies and for them an advanced training course will be sufficient. A modern agrometeorological service needs highly qualified specialists who improve their skills and their capacity to meet the changing needs for services. External training programmes for employees should focus on specific training centres so that training is consistent, and the exchange of acquired skills is ensured within the organization as a whole. Low motivation of employees leads to an increase in employee turnover and a shortage of highly qualified specialists. Continuous training is also a means of retaining staff for a longer time, which would partially offset the relatively low salaries. A well-designed continuing education programme would provide more career opportunities and encourage staff retention as employees acquire new skills. As a first step, mechanisms should be created for the practical training of personnel in specialised agrometeorological educational institutions in foreign countries and the Commonwealth of Independent States (CIS).

It is obvious that without increasing personnel and financial stability, Kyrgyzhydromet will not be able to ensure the preservation of investment in infrastructure. To facilitate the process of technical re-equipment and maintain service potential, a set of measures will be required to improve specialised agrometeorological

services and staff training. It can be expected that the totality of all activities, including the strengthening of the technological base of agrometeorology services, will provide a solution to the problem by creating conditions for its stable functioning.

The introduction of modern technologies for processing, forecasting and presenting information is a prerequisite for improving the quality and range of Kyrgyzhydromet's information products. It is equally important to continue the development, including the training of specialists, and if necessary, the adaptation of specialised software products received under various assistance programmes with the involvement of international expertise. It is also necessary to carry out activities aimed at improving the methods of compiling both general forecasts for state bodies and the public, and specialised forecasts for certain categories of users. It is necessary to create conditions for interaction between the Central Department of Mining and regional administrations, with a clear definition of the list and requirements for national meteorological and hydrological service products to meet the needs of management structures at regional level, organizations of the agricultural and industrial sectors, and conditions for support of national meteorological and hydrological services, including the provision of operational service costs.

Additional capacity-development efforts should include pilot studies covering the facilitation of the engagement of the climate-service community in the co-production of agrometeorological services, including co-design, co-development, co-evaluation and co-dissemination stages; and workshops where users are informed of the benefits of the use of climate information for driving decision-making at farm level.

# Disaster risk reduction in agriculture

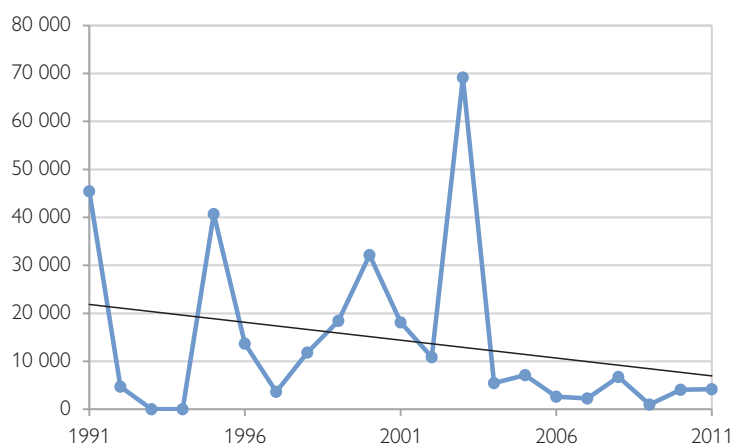
## Agricultural disasters risk assessment, hazards vulnerability analysis

More research is needed to assess the impact of climate change on the productivity of major crops and livestock, and on the vulnerability of agroecosystems and rural populations in Kyrgyzstan. An assessment of the risks of agricultural disasters in the country has not been done by any organization, although this should be the responsibility of the Ministry of Agriculture. This is primarily related to the low level of expertise among ministry employees, as well as to the lack of necessary data and adapted methods. The potential of Kyrgyz research institutes is insufficient for such work. Moreover, this work requires interdisciplinary efforts and adapted techniques. Climate-change risk assessment (including vulnerability and adaptation potential) is currently being handled by a small group of experts during the preparation of national communications and funded by UNDP.

Since agricultural disasters are mainly associated with climate-related hazards, an attempt to assess their risk was made by a group of experts at the State Committee on Ecology and Climate of the Kyrgyz Republic (SCEC), as part of the preparation of Kyrgyzstan's climate profile and national climate communications. Due to various circumstances (a lack of statistical data, lack of expertise, etc.), Kyrgyz experts in their assessment focused more on the degree of sensitivity of the agricultural system, rather than on actual vulnerability, since the adaptive potential of the system was not taken into account (IPCC, 2007).

The Second National Climate Communication Report of Kyrgyzstan (Carter, 2008) assessed the sensitivity of some crops to changes in heat supply, as it largely determines the possibilities of crop cultivation. According to the report, over this century, the northwest and southwest regions of the country will become more favourable for the cultivation of different varieties of cotton and grapes. Grapes could be cultivated on the lakeside plain of the Issyk-Kul basin and even in the Inner Tien Shan at altitudes of up to 2 400 metres. A conducted assessment, based on the humidification model, allows us to conclude that the country's landscape is expected to become more arid.

Figure 10. Combined yield losses (wheat, barley and maize) from three types of climate-related disasters (constant 2005 USD)



Source: Ilyasov *et al.*, 2013.

In the Climate Profile of Kyrgyzstan (Ilyasov *et al.*, 2013), a sensitivity assessment was carried out for wheat, barley and maize. The analysis focused on establishing a connection between climatic changes observed over a 20-year period of time (1991–2011) and a loss of crop yields due to three types of climate-related disasters: drought, water shortages; rain storm, hail; frost, snow fall. Total losses from all three types of disasters were analysed together, and the data did not show any increase in crop losses, despite the observed climate-change trends (Figure 10). The observed trends will presumably be the same in the future; therefore, we may expect that the impact of the above events will reduce.

However, there are some reasons that can explain these rather low (even decreasing) crop losses (Ilyasov *et al.*, 2013):

- weakness of the monitoring system;
- actual reduction in frequency and severity of climate impacts under current climate trends;
- focus mainly on crop irrigation farming.

In the Climate Profile of Kyrgyzstan (Ilyasov *et al.*, 2013), the livestock sector was considered from the perspective of forage supply. The analysis of the impact of the observed climate change on the yield of fescue formations on pastures needs to be done to formulate the necessary actions to address potential changes. A preliminary assessment was made, taking into account the effects of the main meteorological parameters (temperature and precipitation) on productivity. Across the whole country, the analysis showed a positive correlation of fescue yields with an increase in temperature and precipitation. For all climatic zones, on average, with the temperature increasing by 1 °C, the yield would increase by 0.28 tonnes/ha; and with each millimetre increase in annual precipitation, the yields are expected to increase by 0.00096 tonnes/ha (Ilyasov *et al.*, 2013). For a more specific assessment of sensitivity, it is necessary to conduct a more detailed study to identify other factors determining the productivity of pastures, as well as to study changes in the yield of other types of eaten (except fescue) and non-eatable vegetation.

As another example, a less comprehensive assessment of pasture sensitivity was also made in a synthesis report by IFAD on the impact of climate change on pastures and livestock systems in Kyrgyzstan (IFAD, 2013). Experts also conducted a generalised analysis of the climate-change adaptation potential for Kyrgyzstan, and showed the results through a series of maps in the Climate Profile of Kyrgyzstan. The highest vulnerability of agriculture is in the Talas, Chuy, and Batken regions as the most arid territories with large areas of cultivated land. The lowest vulnerability is in the Naryn region, mountainous territory with large areas of pasture land (Ilyasov *et al.*, 2013).

The following problems currently exist in the area of disaster risk assessment and sensitivity analysis in agriculture in Kyrgyzstan:

- inconsistency of the existing monitoring network (quantity and quality of observations) with an increase in the number and scale of manifestations of dangerous natural processes and phenomena affecting agriculture and food security;
- no clear distribution of functions and responsibilities between organizations involved in risk assessment; no organization responsible for assessing agricultural risks in the country;
- since there is virtually no assessment of agricultural risks, there is no planning for risk prevention and disaster response;
- disaster risk assessment is not taken into account in socioeconomic development plans, especially at the level of *aiyl okmotu*;
- low level of information exchange between participants in risk management and actors involved in public awareness of disasters;
- lack of regulations and SOPs for government and local authorities on early warning and response;
- poor training of young specialists in monitoring and risk assessment, especially in the field of application of geoinformation technologies, and lack of continuity in personnel policy.

International organizations such as UNDP, ACTED, as well as the national NGOs CAMP Alatoo, and MSDSP KG (an initiative of the Aga Khan Foundation), conduct various activities to build the capacity of local communities to reduce the risk of natural hazard-induced disasters within the pilot territories. UNDP works in local communities in Osh and Jalal-Abad regions, covering more than 100 municipalities, ACTED in Batken region, MSDSP KG in Osh and Naryn regions, and CAMP Alatoo in Osh region. Each organization has its own tools, but the approaches are similar: mobilisation of rural communities, training, joint disaster risk assessment, development of local hazard management plans and support for their implementation. Almost all organizations create local rural institutions, and rural rescue teams. However, experience shows a low effectiveness of such an approach. Due to the fairly intensive migration processes in the country, rescue teams are quickly breaking up, and plans without long-term support and funding are not being implemented.

## Preparedness and emergency action plans

The Emergency Response Plan in Kyrgyzstan (MES, 2018j) has been developed and adopted to coordinate the actions of disaster management actors at all levels with the identification of key emergency response procedures. The plan was adopted in 2018 and is considered to be an action plan to protect the population and the territory from natural and man-made emergencies, their prevention, and elimination of consequences of such disasters. This document summarises response measures but does not identify a timeline for their implementation. The plan describes the forces and means involved in disaster response, SOPs, key implementation indicators, sources of funding, executors. In relation to the agricultural sector, the emergency response plan covers only epizootic hazards.

Activities focused on the prevention of an epidemic, epizootic, epiphytotic include:

- routine immunization of people and animals;
- planned sanitary and hygienic, disinfection and disinsection measures;
- preventive anti-epizootic measures;
- increasing the capabilities of laboratory diagnostics;
- public health education;
- veterinary and sanitary supervision during the movement of animals, procurement and transportation of raw materials of animal origin by all means of transport;
- veterinary and sanitary supervision of markets, bazaars, other points of temporary concentration of animals;
- veterinary supervision of meat processing plants, abattoirs, as well as enterprises and organizations for the procurement, storage and processing of raw materials of animal origin;
- protection of livestock from the introduction of pathogens of infectious diseases;
- veterinary education and animal insurance;
- preventive measures to protect plants from infectious diseases;
- cultivation of disease-resistant crop varieties;
- quarantine measures in the zone and outside the zone of infection;
- chemical treatment of crops and planting material in areas of infection;
- compliance with the rules of agricultural technology, the destruction of foci of infection.

Sectoral preparedness and response plans, including for the agricultural sector, have not been developed yet. Local preparedness and response plans are formally developed at the district and local levels. In practice, a standardized format was shared with the *aiyl okmotu* and city hall to be filled in according to a sample.

In a number of pilot communities, as a result of the intervention of UNDP and other international bodies, preparedness and response plans were developed based on a joint disaster risk analysis taking into account the International Strategy for Disaster Reduction. MES and UNDP have created disaster risk management structures in over 100 municipalities. Within this structure, more than 650 local residents have been trained in emergency response, preventive measures, and developing disaster management plans. In addition, hundreds of people in remote areas of Kyrgyzstan participated in 46 UNDP-led disaster mitigation projects. According to our estimates, these interventions have reduced the vulnerability of about 50 000 people in the face of various emergencies. However, further promotion of this initiative by national partners has not been implemented.

In Kyrgyzstan, global international agreements are used as the conceptual framework for developing national policies and strategies for DRR – the SDGs, UNFCCC, Sendai Framework for DRR, Paris Agreement, and so on. Existing DRR plans covering the agricultural sector are:

- Action Plan of the Government of the Kyrgyz Republic for 2019–2023 to implement the development programme of the Kyrgyz Republic for the period 2018–2022 “Unity, trust, creation”;
- Action Plan for the implementation of the Concept of Integrated Protection of the Population and the Territory of the Kyrgyz Republic from Emergencies for 2018–2030 (Stage 1: 2018–2022);
- Emergency Response Plan in the Kyrgyz Republic;
- Action Plan for the implementation of the Program for the Adaptation of Agriculture and Water Resources to Climate Change for 2016–2020;

- MAWRRD's plan to implement the Concept of integrated protection of the population and territories from emergencies;
- Plans of the MES for the implementation of green mitigation projects, special preventive and elimination measures, emergency recovery operations;
- Plans of local governments for civil protection;
- Civil protection plans of MAWRRD, and the SCEC.

The GKR Action Plan for 2019 (GKR, 2019b) has sections on “agro-industrial sector” and “environmental aspect of development, DRR”, where it identifies various cross-cutting and targeted activities in the sphere of DRR, adaptation to climate change and food security, aimed at institutional strengthening or structural measures, related mainly to construction and technical equipment. The plan defines dates, indicators/planned results, indicators and implementing agencies for each activity. The following tasks and activities related to agriculture should be noted:

- preservation and improvement of soil fertility of agricultural lands;
- carry out soil surveys (soil adjustment) of *aiyl aimaks*, soil monitoring;
- develop draft government resolutions On Approval of the Rules for Phytosanitary Zoning of the Territory of the Kyrgyz Republic on Quarantine Pests; On Approval of the Program for the Development of Livestock Breeding and Pasture Economy in the Kyrgyz Republic for 2019–2023; On the approval of the State program on stabilization of the situation in the field of plant quarantine for the period 2019–2023; On approval of the Concept for the development of drip irrigation in the Kyrgyz Republic for 2019–2025;
- carry out work on the construction and equipping of quarantine phytosanitary laboratories for the certification of agricultural products in Batken, Jalal-Abad and Naryn;
- conduct state measures to control locust pests, to combat the american white butterfly;
- expand the use of innovative technologies for water-saving and adaptation;
- expand the use of drip irrigation technology in the country (bringing up the total land area under drip irrigation to 2 500 ha).

The action plan for the implementation of the Concept of Integrated Protection of the Population and the Territory of the Kyrgyz Republic against Emergencies for 2018–2030 (Stage 1: 2018–2022) (GKR, 2018j) consists of four priorities of the Sendai Framework for DRR and includes the following measures covering the agricultural sector:

- improve the efficiency of the system for monitoring and forecasting emergencies;
- creating a data processing centre;
- web portal of information on monitoring emergency situations and mechanisms for involving the population in hazard observation;
- glaciological research and climate-change centre for monitoring glaciers and breakthrough lakes;
- development and improvement of statistical reporting forms in the field of civil protection, including the assessment of damage and loss;
- assessment of seismic resistance of residential buildings in zones with seismicity of eight or more points, and the creation of a database;
- conducting epizootic zoning;
- assessment of risks from hazardous production facilities;
- increase the safety culture of the population – the inclusion of life safety in compulsory school subjects;
- development of disaster risk reduction education materials;
- creation of pilot training and advisory centres for training the population in emergency situations;
- development of the regulatory legal framework and organizational structure of the state system of civil protection – creation and organization of the work of the emergency medical service (taking into account the coverage of the rural population);
- implementation of disaster risk management aspects in the activities of local governments – development and implementation of sectoral and territorial DRR programmes/plans;
- safety data sheets of settlements and objects based on disaster risk assessment;
- introducing disaster risk assessment into the methodology of development planning and updating the socioeconomic development plans on a pilot basis;
- development of an automated control and alert system – carrying out a complex of works on



- installing a software and hardware complex to intercept television and radio channels;
- connecting regions of the republic to a single duty dispatch service (system 112) covering the entire territory of the country;
- development and implementation of mitigation and adaptation projects, including green mitigation projects;
- improving the system of compulsory housing insurance against natural hazard-induced disasters;
- development of tools for financing DRR measures and a mechanism to encourage local investment in DRR;
- modernization of irrigation systems to prevent emergencies;
- recultivation of tailings dumps and landfills in rural communities (Min-Kush, Kaji-Say, Shekaftar);
- improve the level of preparedness and response capacity – creation of mobile hospitals to provide timely emergency medical care in view of the coverage of the rural population;
- develop institutional and legal frameworks for coordinating long-term recovery;
- develop a response mechanism to slow-onset emergencies or disasters;
- develop minimum standards for the provision of humanitarian assistance, taking into account age and gender aspects.

In addition to this plan, MAWRRD and the SIVPS have their own sectoral plans approved by the Civil Protection of the Kyrgyz Republic. These plans duplicate the activities of the action plan for the implementation of the Concept of Integrated Protection of the Population and the Territory of the Kyrgyz Republic against Emergencies for 2018–2030, and do not have specific details. This indicates the need to strengthen the national capacity to develop sectoral DRR plans.

Emergency recovery, special preventive and elimination measures, and green mitigation are developed by the structural units of MES. They indicate a specific place of implementation, design estimates, technical solutions, types of work, deadlines, involved agencies and technical means, performance indicators, grounds for the decision and project cost. At the same time, it should be noted that there are no regulations in the structures of MES for selecting and planning the above activities based on analysis and assessment of the risks of disasters and vulnerability.

The Action Plan for the implementation of the Program for the adaptation of agriculture and water management to climate change for 2016–2020 (MAFILR, 2016b) identifies key activities in crop, livestock, pastures, water resources and water sectors. However, these activities do not have sufficient financial support. Funding for individual activities, mainly related to structural mitigation, is financed from the state budget with a large gap in financial resources. In such a situation, most of the activities are focused on finding additional foreign investment and attracting financial resources from international organizations, for instance activities focused on:

- creation and equipment of plant protection laboratories and crop breeding for livestock;
- development of drip irrigation and organic farming;
- pasture rehabilitation;
- ameliorative improvement of irrigated land aimed at lowering the level of groundwater;
- rehabilitation and construction water infrastructure facilities.

Currently, with technical support from FAO and WFP, work is underway to develop a Food Security and Nutrition Programme in Kyrgyzstan for 2019–2023, and an action plan. As with the previous programme on food security, according to the majority of experts interviewed, it was not fully implemented. The experts noted the need to learn the lessons and to conduct monitoring and evaluation of the implementation of the new programme with the publication of monitoring results on the MAWRRD website.

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## Post-disaster needs assessment, damage and loss assessment in agriculture

In order to conduct an assessment of damage and needs, the World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR) project in 2013 developed a Methodological Guide for damage and needs, assessment for reconstruction and recovery from emergency situations in the Kyrgyz Republic (MES, 2013b), which was approved and recommended for use by the Interdepartmental Commission for Civil Protection (ICCP). This manual establishes a unified approach for government agencies, local governments, organizations

and enterprises, and individuals to conduct an assessment of possible damage, loss and needs. However, upon the completion of the project in 2013, work on the improvement and implementation of the post-disaster needs assessment (PDNA) methodology did not continue. At the same time, the Resolution of the Government of the Kyrgyz Republic No. 597 of 11 November 2019 approved the “procedure for assessing damage from emergency situations”. At present, the following problems exist in the national damage and needs assessments system:

- no recovery framework in the SCPS – only measures for an early recovery as part of emergency response;
- the multidimensionality of PDNA, its relationship with the recovery framework and the practical purpose for developing a strategy and recovery plan for emergency situations at all levels, are not taken into account;
- participants of disaster risk management (ministries and departments, civil protection commissions on regional, district, local levels, private companies) all use different approaches in damage assessment;
- no sectoral methods of PDNA for agriculture, ecology, water management, food, gender;
- The State Agency for Architecture, Construction and Housing and Communal Services’ (Gosstroy’s) regulatory and technical documentation establishes complex and long-term procedures which require streamlining, primarily for civil protection commissions (CPCs), for the purpose of operational PDNA in the agricultural sector in the reconstruction of housing, social facilities, irrigation and land-reclamation facilities, and other industrial and infrastructure facilities;
- existing methods and practices of damage and needs assessments after disasters do not comply with international principles and standards;
- coordinating body for the development and implementation of common approaches, principles and requirements for PDNA has not been defined;
- insufficient level of political support for the introduction of international PDNA methodologies in the SCPS;
- no training modules on PDNA in the specialised structures for the training of specialists in the field of disaster risk management;
- it is necessary to develop regulatory support for the implementation of the main approaches, principles, requirements, procedures and conceptual framework of PDNA.

Regarding damage and loss assessment in agriculture, the Department of Agricultural Statistics of the Central Office of the National Statistical Committee (NSC) annually assesses the losses in agriculture based on the collected data on destroyed crops (in ha) and mortality of livestock and poultry (in heads). Currently, no disaster loss data is collected for fisheries and aquaculture. Data on forestry has been collected since 2018 by MES, and a summary is submitted each year to the NSC (Mursabekova, 2019). At the local level, information on the lost sown area is collected on a monthly basis by the local self-government body, in accordance with the corresponding report form No. 7 ‘Report on Harvesting, Sowing Winter Crops and Fall Plowing’. Information on destroyed sown areas is reported in the write-off acts and decisions of the state district administrations. However, it was noticed that the free form of the acts prepared at local level does not allow the creation of a time series with data on damaged crop area and livestock deaths that would indicate the cause. A report based on the 4-CX form gives a complete picture of crop area losses.

A specialist from the local self-government body submits the documents on the destroyed crops to the territorial body of state statistics. This information is used as the basis for filling in report form No. 4 (write-offs) ‘On the Results of Sowing Crops for this Season’s Harvest’. Monthly, the publication On Harvesting Crops reflects the data – in column 1, “sown area”, and in column 2, “harvested area”, with due consideration to losses detected. The above publication, with data by district, can be found on the website of the NSC. A specialist from the local self-government body submits data on the livestock and poultry killed in accordance with the mortality acts and resolutions of state district administrations to the territorial body of state statistics. They are used as the basis for the annual preparation of table No. 7, ‘Livestock Turnover’, by territory (Mursabekova, 2019).

While the NSC does assess direct economic losses in agriculture, it does not currently include estimations on the losses due to the reduced amount of crop/livestock production due to experienced damage, and there are no estimations of the cost of production damage, and damage to assets. Some other challenges in relation to damage and loss assessment include the lack of cooperation between the district departments of MES with the territorial bodies of state statistics (Mursabekova, 2019). Other issues relate to the rather short-term storage

of information (at the territorial level data about damage is stored only for three to five years); for the forestry sector, a limited number of disaster impact assessment indicators and corresponding underestimation of the total losses (the cost of non-forestry products is not currently included in the calculations); lack of an aggregated database. Some development is needed regarding the estimation of future losses in the agricultural sector, and regarding the improvement of data accuracy, particularly in the livestock sector (FAO, 2020d).

During the national training on disaster damage and loss assessment in agriculture that took place in Kyrgyzstan in November 2019, it was established that currently collected data (at national level, aggregated by district) is mostly sufficient for calculations under FAO's Methodology for Damage and Loss Assessment in Agriculture. Kyrgyzstan recognised the FAO methodology as an effective tool in achieving the country's needs, and MAWRRD will work on adapting, accepting, and possibly towards incorporating it in the upcoming agricultural insurance programme, in order to improve evaluations of farmer compensation. During the national training, it was decided that an agricultural database will be developed, as well as a toolkit for the survey of local authorities, and specialised software for data collection and processing (FAO, 2020d).

## Agricultural insurance

One of the priority tasks of disaster risk management is the development of disaster insurance, which is just beginning to develop in the country. In 2015, the Law of the Kyrgyz Republic On Compulsory Insurance of residential premises against fire and natural hazards (No. 209) was adopted. In 2016, provisional rules, methods for calculating refunds, tariffs and liability limits, and a procedure on the interaction of state bodies, were approved (Table 9).

Table 9. Data on home insurance against disasters

Year	Number of contracts	Insurance premium (million KGS)	Insurance premium (USD)	Insurer's liability (billion KGS)	Insurer's liability (USD)
2016	10 813	8.6	122 857	7.4	105 714
2017	65 524	51.6	747 826	42.4	614 492
2018	87 494	70.7	1 000 000	62.8	913 043

Source: State Insurance Company, 2018.

An insured event occurs when damage is caused by the following hazards – earthquake, mud flow, high water, breakthrough of high-mountainous natural lake dams, avalanche, collapse, rock fall, landslide, flooding with groundwater, strong wind, prolonged rain, heavy rain (including sleet and snow), heavy snowfall, blizzard, hail. The insured amount for a rural area is KGS 500 000 (USD 7 153), which approximately corresponds to the cost of a small three-bedroom house in a rural area. The policyholder is entitled to insure the residential premises on a voluntary basis for an amount in excess of the minimum insured amount for compulsory home insurance. Before the introduction of a home insurance system for disasters, the state could allocate compensation of KGS 50 000 (USD 710), which was extremely inefficient. The amount of compensation did not even partially compensate for the damage.

Given the above circumstances and the size of the insurance tariff, it can be concluded that home insurance against disasters is a socially oriented policy and the most effective form of partnership between citizens and the government in enhancing disaster preparedness. It is necessary to strengthen the work to eliminate the following problems:

- lack of the majority of the rural population of the necessary documents for insurance;
- violation of technical requirements in the construction of houses;
- lack of administrative controls for the implementation of the law on compulsory home insurance;
- a large number of insurance risks (18 risks) at low tariffs (0.12 percent) with a high level of insurance liability;
- low level of insurance culture among the population and poor information support;
- lack of insurance policy requirements for loans, real estate transactions;
- the absence of a regulatory framework in terms of resettlement of citizens from emergency zones and the transfer of these lands to *aiyl okmotu*;
- high cost of advertising and lack of support from public and private information structures and companies.

While the government currently provides farmers with the possibility to insure their houses (the main element of rural infrastructure), there is need to focus on securing affordable insurance for livestock and crops. There is an active Law on the features of insurance in crop production (No. 31, 2009); however, in the existing environment it does not actually work – in recent years, not a single case of contracting and payment of the insured amount was recorded in the crop and livestock sectors for damage caused by natural and biological disasters. The main problem lies in the fact that in practice, it is impossible to clearly determine the occurrence of the insured event, taking into account the interests of all parties. This issue does not have a regulatory and legal framework. It is also difficult to determine insurance rates. Currently, it is not profitable for insurance companies to work at low insurance rates, and high rates are not attractive for farmers. It is also important to note the low level of an insurance culture among the population. At the moment, there are no specific legal regulations covering the insurance of agricultural equipment, seeds, livestock, and agricultural products. At the same time, the general Law On Insurance does not prohibit a farmer and an insurance agent to sign an insurance contract. However, as long as the mentioned issues are not regulated, they will never be able to reach an agreement.

A dialogue between farmers and insurance companies should be established and the Ministry of Agriculture should act as a moderator. It is necessary to create conditions for such insurance to function. In this regard, it is extremely important to conduct a sociological study on the development of a comprehensive system of insurance against disasters in agriculture, involving various partners – farmers, insurance companies, government agencies, and so on. It is also important to begin a series of expert meetings on priority measures for the development of insurance in crop production, animal husbandry, and various activities and resources related to food security. For example, many leasing companies require registration of an insurance policy when buying agricultural equipment.

In the course of interviewing specialists at MES, MAWRRD, and the SIVPS, it was noted that the national system of disaster risk management in agriculture is characterised by the absence of the following important elements:

- sectoral and territorial plans (especially for *aiyl aimaks*) for disaster risk reduction;
- disaster risk analysis and assessment regulations at all levels;
- sectoral methodologies for assessing damage and emergency needs;
- SOPs for the response and early recovery phases;
- the institutional and legal framework for coordinating long-term recovery;
- disaster insurance policies.

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## Programmes and projects related to disaster risk reduction, early warning systems, and agrometeorology services in the agricultural sector

Various UN agencies, including FAO, WFP, and UNDP, as well as other international organizations, such as the German Agency for International Cooperation (GIZ), are implementing a number of programmes and projects related to DRR, EWS and agrometeorology services together with key national institutions. Annex II. **Overview of programmes and projects on DRR, EWS and agrometeorology services in Kyrgyzstan** provides an overview of the relevant programmes and projects already completed or currently being implemented in Kyrgyzstan.

The SCEC, MAWRRD, MES, SARD, the SIVPS and other national disaster risk management structures need to conduct a joint study on the analysis and evaluation of projects of international organizations in the field of DRR and climate change in the agriculture and food security sectors. The results of the study should be aimed at improving the implementation of national programmes and strengthening the institutional capacity of national structures to promote the impact of programmes and projects of international organizations. For example, in the framework of the IFAD market access project, it is planned to create an EWS on pilot sites. Such a system should be implemented at the country level to cover all *aiyl aimaks*. Another important area of such research is the development of procedures for joint monitoring and evaluation of project results in order to create conditions for sustainability and determine long-term results, taking into account the identification of social effects.

# Conclusions and recommendations

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## Legislation and policy

This baseline study concluded that Kyrgyzstan has national DRR legislation; however, the country's laws focus more on general civil protection aspects and activities. Legislation does clearly recognise and categorise various natural hazards, including those affecting the agricultural sector. It covers, for instance, mass infections among the population, as well as animal diseases and mass destruction of agricultural plants by diseases, weeds, and pests. However, the system to address and reduce those risks is not fully developed yet. National legislation clearly defines disaster risk monitoring and forecasting as one of the tasks of the SCPS, which is a joint responsibility of various entities, including the Ministry of Agriculture and Kyrgyzhydromet. Some of the country's main national strategies and programmes quite clearly highlight linkages between climate change and food security, the need for the adaptation of agriculture to climate change, and cover activities related to disaster risk prevention in the sector. For instance, recent policies recognise the risk of habitat expansion of some pests (such as locust) to the north due to the changing climate. However, in these key disaster risk management programmes, agricultural risks are covered only partially, mainly in the area of animal and plant diseases and pests.

The main recommendations for improving existing legislation and policies can be summarised as follows:

- Mainstream DRR into the country's agricultural plans, policies, and strategies, including regional development plans.
- Introduce appropriate amendments to the Law on Local Self-Government and Local State Administration, in terms of expanding issues of local importance and the powers of local self-government and municipal state administration regarding actions related to agricultural disaster risk management.
- Develop state programmes and plans for agrometeorology to strengthen the agrometeorological service, to support agriculture and food security (responsible agency, for instance, MAWRRD).
- Approve the methodological foundations of disaster risk management and the conceptual framework in sectoral programmes and plans for DRR in agriculture and water management. The methodological basis for the development of such sectoral programmes is the International Strategy for Disaster Reduction (ISDR), in which Kyrgyzstan participates. However, many ministries, including the Ministry of Agriculture, Water Resources and Regional Development, do not have sectoral programmes or plans for DRR and adaptation to climate change based on the ISDR.

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## Institutional framework

In Kyrgyzstan, an institutional framework, as well as DRR coordination mechanisms, are currently in place. The main entity responsible for DRR activities and hydrometeorology in the country is the Ministry of Emergency Situations (MES). Among various agricultural disasters, the responsibilities of MES include only biological hazards. Various ministries and organizations perform different tasks related to risk reduction in their own sector and so the Ministry of Agriculture is responsible for state monitoring and forecasting of mass destruction of agricultural plants by diseases, weeds and pests, while the State Inspectorate for Veterinary and Phytosanitary Security (SIVPS) covers animal diseases. However, the remaining agricultural disaster risks are not the subject of their work. Thus, special attention is not paid to the reduction of agricultural disaster risks in the country, and there is no agency responsible for comprehensive DRR in agriculture. The minister of agriculture is part of the Interdepartmental Commission on Civil Protection, which is Kyrgyzstan's main DRR coordination mechanism. The Secretariat of country's National Platform for DRR provides technical assistance to the commission.

However, highlighting the agricultural disaster risks in the priorities of these structures could significantly strengthen the intensification of their work in this direction. There is a clear lack of coordination between sectors, while cross-sectoral issues are not recognised in policy and strategic sectoral planning. Coordination mechanisms between agency officials currently do not support the integration of DRR practices and approaches in agriculture.

Recommendations for the improvement of the institutional framework and coordination mechanisms include:

- Expand the approach of creating local institutions responsible for managing natural resources into integrated natural resource management in order to reduce agricultural disaster risks. This could be done, for example, through sustainable management of land, natural resources and disaster risks in the territories of *aiyl okmotu* and regions. The practice of creating local institutions responsible for managing natural resources at local level, such as pasture committees and water user associations, is taking place in Central Asian countries, including Kyrgyzstan, and is only gaining strength. In addition, expand the practice of creating rural rescue teams and expand their responsibilities in terms of preventing and combating the consequences of agricultural disasters.
- Determine the interaction of the departments and ministries involved in the creation of electronic databases for assessing agricultural risks, damage and loss, their exchange and access.
- Facilitate the promotion of “green” environmentally friendly products and technologies that help reduce risks, disseminate information and knowledge as well as exchange of experiences in this field, and create ecological production networks in relation to agricultural emergency management at local, national and regional levels. In Kyrgyzstan, the experience of promoting a brand of “green” products and technologies is small, although it has an enormous potential. The idea of developing “green” products is based on organic conservation agriculture, which eliminates the use of chemistry in production and, ultimately, prevents degradation and chemical pollution of the natural environment, which provokes agricultural disasters. DRR, food security and adaptation to climate change are interlinked with environmental security. To develop measures with a synergistic effect, it is necessary to explore international experience (for example, with the help of FAO), introduce best practices, and disseminate information, which can be the first step.
- Develop a registry of disaster risks in the agricultural and water management sectors, taking into account climate change and direct impact on food security, in order to support the daily work of disaster risk management bodies.

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## Early warning systems

The country’s early warning systems (EWS) in agriculture is not very well developed. It partially addresses epiphytotics and epizootics; however, it does not cover other hazards such as drought. While national services can provide early warning for meteorological disasters using existing regional and global EWS, no response system to agricultural disasters exists in the country. As a result, affected entities do not know how to act, no response measures are defined, and there are no SOPs for such situations. The existing system of monitoring and prediction of disaster risks is currently characterised by the absence of a fully functional automated monitoring system of natural and man-made emergencies; the absence of a unified system of integrated monitoring and forecasting; a lack of a regulatory framework with a clear distribution of powers, duties, tasks and functions between involved partners; poor interaction between farmers, municipalities and relevant institutions; low level of knowledge among farmers on prevention of epizootics and epiphytotics; lack of regulations for information exchange between ministries, departments and scientific centres. While a market information system exists in the country, the use of this data is currently quite limited. General information on market prices and the availability of basic products is regularly published and is available to the population. However, more in-depth analysis of the situation is needed to make use of this data for early warning (the responsible food safety unit in MAWRRD does not currently perform such analysis).

The following recommendations can be proposed to strengthen the existing EWS:

- Improve an EWS to provide timely information about agricultural hazards and their expected effects on agriculture. The EWS should be based on powerful weather forecasts for at least the upcoming ten days and should ensure that all the information reaches users on time, and that it is usable and useful for them. Improve modelling and predicting capacity relevant to climate services in agriculture.

- Develop and implement in the Unified System for Monitoring and Forecasting Emergencies and Civil Protection of the Kyrgyz Republic, an industry-wide system for early warning of emergencies in the agricultural sector. Identify a line agency (e.g. MAWRRD) that will be responsible for monitoring, evaluating, forecasting and preventing agricultural disasters. Strengthen the expert and technical potential of the relevant departments. Create an interdisciplinary expert group and build capacity.
- Provide training of staff to improve modelling and analytical capabilities needed to inform decisions and decision-making processes.
- Equip specialists from district agrarian development directorates (RUAR) with knowledge on prevention and response to agricultural disasters, and provide them with predictive timely information, which will increase the availability of this knowledge for farmers and other agricultural producers.
- Develop and implement information dissemination channels accessible for rural agricultural producers to deliver information on EWS to consumers (including market information systems), to reduce the risk of natural hazard-induced disasters for agriculture in Kyrgyzstan. To facilitate access to market information, it is necessary to conduct a content analysis of existing web platforms that provide such data and develop a list of reliable resources (to be available on the MAWRRD website).
- Improve communication between *aiyl okmotus* and farmers on one side, and relevant institutions on the other, through enhancement of feedback mechanisms and participatory approaches.

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## Agrometeorology services

The country's existing agrometeorology services are facing a number of challenges. Kyrgyzhydromet (subordinate to the MES) is the responsible agency for providing those services to the public in Kyrgyzstan. At the moment, agrometeorological equipment and instruments are physically outdated, often cannot be repaired and require urgent replacement. Kyrgyzhydromet has a small unit that covers agrometeorology, but it requires institutional strengthening – for example, currently there are no specialists with a degree in agrometeorology working in the unit. Agrometeorology services have not yet been given enough attention in terms of capacity development (technical and personnel), and it is in urgent need of such support. At the same time, information support for farmers is developed quite poorly. Weather forecast, storm warnings and agrometeorological bulletins are available on Kyrgyzhydromet's website. However, specialised information (detailed meteorological, hydrological, agrometeorological and on background concentrations of pollutants in the atmosphere) is provided on a contractual basis for a fee.

Recommendations for improvement of agrometeorology services include:

- Expand the network of agrometeorological observations involving the private sector, and upgrade agrometeorological equipment and instruments.
- Develop a course on agrometeorology and management of agricultural emergencies. The training programme of agricultural specialists at the Agrarian University is currently expanding. There is an opportunity to include a course on agrometeorology and management of agricultural emergencies in the programme.
- Develop and disseminate information material for farmers. Translate user needs (particularly those of farmers) into tailored agrometeorological services. Develop a climate-services community that engages users, providers and researchers.
- Clearly define responsibilities in the production and delivery of climate services. Organize sensitisation workshops and discuss institutional arrangements and agreements for data sharing.
- Develop and implement national strategies for digital agriculture as part of national information communications technology (ICT) infrastructure.

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## Disaster risk reduction in the agricultural sector

Kyrgyzstan does not have a comprehensive mechanism for DRR in the agricultural sector, although this should be the responsibility of the Ministry of Agriculture. This is primarily related to the low level of expertise among ministry employees, as well as to the lack of necessary data and adapted methods. There is no sectoral plan on

DRR and no emergency preparedness and response plans in place that would cover all agricultural disasters (the existing one addresses only epizootic hazards). However, such a situation is also common for other sectors. The existing law on crop insurance does not actually work in the current circumstances, while there is no law covering livestock. The national system of disaster risk management in agriculture is characterised by the absence of sectoral and territorial DRR plans (especially for *aiyl aimaks*); disaster risk analysis or assessment regulations at all levels; sectoral methodologies for assessing damage and emergency needs; SOPs for the response and early recovery phases; the institutional and legal framework for coordinating long-term recovery; and disaster insurance policies. Regarding damage and loss assessment in agriculture, the NSC collects data on losses in crop and livestock production, but not in fisheries. Some other challenges include the lack of cooperation between the district departments of MES with the territorial bodies of the NSC; and for the forestry sector, the limited number of disaster impact assessment indicators and corresponding underestimation of the total losses for the sector; as well as a lack of an aggregated database.

The following recommendations are proposed for the improvement of the DRR system:

- Adapt international methodologies for assessing agricultural disaster risk, including the assessment of sensitivity, vulnerability, damage and adaptive capacity, and apply them at the national, regional and local levels. Initiate the widespread implementation of the FAO capacity-development project on DRR and preparedness in the agricultural sector at the *aiyl aimak* level, using the example of the pilot project in Uzgen district.
- Develop and adopt risk-assessment indicators and conduct regular monitoring.
- Regularly develop agricultural disaster risk assessment reports, recommendations and actions taken.
- Keep track of the implementation of all international projects in the field of DRR in the agricultural sector, and adaptation to climate change.
- Develop effective measures and mechanisms to address the slow-onset disasters and threats associated with climate change (temperature rise, glacial retreat and related impacts, soil salinisation, land and forest degradation, loss of biodiversity, desertification).
- Develop and approve adaptation and mitigation plans for agricultural disaster risks (general sectoral DRR plan and for each of its sub-sectors) and preparedness and response plans at the national, regional and local levels based on the assessments and developed measures and mechanisms for the slow-onset disasters and threats associated with climate change.
- Use the experience of international organizations (UNDP, FAO, ACTED, etc.) in assessing risks and in developing plans at the local level. Monitor and evaluate the implementation of these plans.
- Develop and disseminate technologies that facilitate monitoring, early warning and reducing the risks of agricultural disasters. Use traditional knowledge as a basis for documentation and dissemination of easy-to-use technologies to prevent and reduce the risks of agricultural disasters among farmers and other agricultural producers. The country is rich in traditional knowledge, which can become the basis for such work. In addition, it is necessary to establish a mechanism for the transfer of environmentally sound technologies to reduce disaster risks in agriculture.
- Develop and adapt a methodology for calculating the benefits and costs of applying preventive measures to manage agricultural disaster risk. In this methodology, in addition to direct damage, social and environmental aspects should also be transformed into financial indicators. The methodology will help to make the economic benefits of applying preventive measures in agriculture more visible and clear.
- Complete the review, adaptation and implementation of the FAO assessment methodology for damage and loss from disasters caused by natural hazards in agriculture and forestry. Consider the possibility of capacity-development activities for the employees of the Ministry of Agriculture.
- Develop software for entering and processing information on damage and loss in agriculture in offline and online modes in order to create a statistical database.
- Conduct training for employees of the NSC, MES and local governments to build their capacities in collection and exchange of data on damage and loss in agriculture.
- Create conditions for the proper functioning of the existing Law on the Features of Insurance in Crop Production, through provision of a regulatory and legal framework for the law (the mechanism which would define the occurrence of the insurance event, and determine insurance rates, and so on). Consider the issue of insurance in animal husbandry against natural hazards.



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# Annexes

## Annex I. List of interviewees

<b>Experts of international agencies</b>		
1.	Abdiev Aziz	International Finance Corporation/IFC project consultant
2.	Abdrakhmanov Marat	UNDP, DRM project coordinator
3.	Abdiraimov Taalai	ACTED, project manager
4.	Alibakieva Cholpon	GEF/FAO project manager
5.	Bekulova Jyparkul	UNEP/GEF assistance to Kyrgyzstan in the preparation of the Fourth National Report, project manager
6.	Grebnev Vladimir	UNDP project coordinator
7.	Isabaev Kanybek	Aarhus information centre in Osh
8.	Kylychev Kumar	UNDP advisor, project coordinator
9.	Myrzanalieva Zhypar	Disaster Response Coordination Unit
10.	Mayackaya Inna Akimovna	World Bank/hydrometeorology modernization project
11.	Jukusheva Tolkun	World Bank/Asian Development Bank projects operations officer
12.	Toktomametova Jyldyz	FAO, DRR specialist
13.	Torobekov Ulan	World Bank project manager
14.	Turusbekov Esen	UNICEF programme specialist
16.	Tynaliev Marlen	FAO project national coordinator
17.	Sedrakyan Armen	FAO policy officer
18.	Ulankyzy Kanykei	FAO programme assistant
19.	Umaraliev Ruslan	WFP project manager
<b>National experts, Ministry of Agriculture</b>		
20.	Alimbekova Nagima	Department of Pasture Livestock and Fisheries, GIS specialist
21.	Alchibekova Damira	State Water Resources Agency under the GKR, coordinator of the project National water resources management
22.	Arzybaev Bekkul	Specialist of Food Security Department
23.	Bekulieva Anarkul	Head of Food Security Department
24.	Bukuev Aybek	State Water Resources Agency under the GKR, project director, Development of the Sarymsak Irrigation System
25.	Doolbekov Koshoy	Plant Quarantine Department
26.	Janybekov Daniyar	Specialist of Food Security Department
27.	Joloev Bekjan	Specialist of Food Security Department
28.	Madenov Bakytbek	Department of Plant Quarantine
29.	Nurbaev Adyl	Department of Plant Quarantine, head of division of phytosanitary control
30.	Penkina Ludmila Mihailovna	Pasture expert
31.	Pimenova Tatyana Ivanovna	State Institute for Land Management/Kyrgyzgiprozem/ head of Pasture Monitoring Department
32.	Sharlaeva Lubov Sergeevna	Kyrgyzgiprozem, head of the GIS group

33.	Sulaymanov Ishenaly	Civil protection specialist
34.	Sultankulova Jyparkul	Specialist of Food Industry Department
35.	Tokbaev Renat	Head of External Relations and Investments
36.	Tuleev Tamchybek	Director of Project Implementation Department
37.	Uchkempirov Erkinbek	Kyrgyzgirozem, deputy director
38.	Usupov Emil	State Water Resources Agency under the GKR, agricultural specialist
<b>Ministry of emergency</b>		
39.	Abdykerimov Samat	Kyrgyzhydromet, head of the Marketing Division
40.	Begimkulova Jazgul	Kyrgyzhydromet, chief specialist
41.	Ermатов Ruslan	Kyrgyzhydromet, head of the Application and Web Development Division
42.	Isaev Erkin	Kyrgyzhydromet, chief specialist of the Division of Agrometeorology
43.	Kadyrova Gulshat	Department for the Protection of the Population and Territory
44.	Kasymova Mahbuba Radjabovna	Kyrgyzhydromet, head of Weather Forecasting Division
45.	Kojevnikova Tatjana Anatolyevna	Kyrgyzhydromet, head of Telecommunications Division
46.	Nazarkulov Kydyr	Emergency Monitoring Department, GIS specialist
47.	Nursultan Seyitbekov	Emergency management center
48.	Omoeva Kenjasha	Analysis and Forecasting Division, specialist
49.	Omurzakova Sharipa	Kyrgyzhydromet, chief of agrometeorology division
50.	Sakhev Daurbek	Emergency Monitoring Department, deputy chief
51.	Sharshenov Bolotbek	Division of Surveys of Hazardous Natural Processes
<b>Agency for Environmental Protection and Forestry</b>		
	Aliev Mayrambek	Division of Sustainable Forest Management
52.	Halmurzaev Ali Saidovich	Center for State Regulation in the Sphere of Environmental Protection and Ecological Safety Sector manager
53.	Koblickaya Tatyana Mihaylovna	Division of Sustainable Forest Management
<b>Insurance companies</b>		
54.	Isakulov Nurdin	“Kyrgyzstan” Insurance Company
55.	Tagaev Rustam	State insurance organization
56.	Bazavluk Denis	Insurance expert



## Annex II. Overview of programmes and projects on DRR, EWS and agrometeorology services in Kyrgyzstan

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Improving the population's safety against fires by enhancing the potential of the fire and rescue service in the Kyrgyz Republic	Kyrgyzstan	International Cooperation Agency of the Republic of Korea (KOICA), USD 7 351 600	UNDP	2019–2022	Improving the population's safety against fires by enhancing the potential of the fire and rescue service in Kyrgyzstan. Expected impact: reduction of loss of life and reduction of damage from emergency situations. The expected impact will be achieved through modernization of fire-rescue units and equipment to ensure the safety of vulnerable populations and strengthening fire-fighting capabilities to protect the public, especially women and children.
Strengthened capacity for integrated risk management in the Kyrgyz Republic and regional cooperation in Central Asia	Central Asia, including Kyrgyzstan	Government of Japan USD 8 377 636	UNDP	2017–2021	The goal of the project is to strengthen the capacity of Kyrgyzstan for integrated disaster risk management, as well as to strengthen regional cooperation of the Central Asian countries in this area by: 1) Creating favourable conditions for the application of innovative technologies within the national disaster risk assessment system; 2) Strengthening the national disaster risk monitoring and EWS; 3) Strengthened response and early warning capacity; 4) Contribute to the expansion of regional cooperation between the emergency departments of the countries of Central Asia in the framework of the Central Asia Plus Japan Dialogue. ( <a href="https://open.undp.org/projects/00098321">https://open.undp.org/projects/00098321</a> ).
Strengthen institutional and legal capacity to improve the national monitoring and environmental information management system	Kyrgyzstan	Global Environment Facility (GEF), UNDP USD 2 210 000	UNDP	2015–2018	The goal of this project is to strengthen the national environmental information management and monitoring system, to automate the collection, storage, processing and provision of information on the state of the environment, public health in the light of solving priority environmental problems. The system will provide a comprehensive assessment and comparative analysis of the environmental situation, both geographically and regionally, and determine the priorities of environmental problems. In addition, it will allow to identify the causes affecting the deterioration/ improvement of the ecological situation. The focus is on managing data and information to formulate sectoral development plans in order to effectively fulfil commitments under global environmental conventions.

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Sustainable and climate sensitive land use for economic development in Central Asia	Central Asia, including Kyrgyzstan	Federal Ministry for Economic Cooperation and Development of Germany	GIZ / German federal enterprise for international cooperation	2017–2020	A range of activities is implemented – from direct community support and inter-sectoral policy dialogue to promoting cross-border cooperation and regional partnerships. The main areas of work are forest and grassland management, environmental economics, climate adaptation, knowledge management, environmental education and awareness raising ( <a href="http://www.naturalresources-centralasia.org/index.php?id=1">http://www.naturalresources-centralasia.org/index.php?id=1</a> ; <a href="https://www.giz.de/en/worldwide/14210.html">https://www.giz.de/en/worldwide/14210.html</a> ).
Ecosystem approach for adaptation to climate change in high mountain regions of Central Asia	Kazakhstan, Kyrgyzstan, Tajikistan	German Federal Minister for the Environment (BMU) EUR 6 500 000	GIZ	2015–2020	The goal is the development and implementation of innovative measures and approaches for adaptation to climate change based on ecosystems in selected small-scale water basins, using all available experience. This approach provides an opportunity to direct climate change adaptation funds to land management improvement activities.
Integrated management of natural resources in drought-prone and saline landscapes of agricultural production in Central Asia and Turkey (“CACILM2”)	Central Asia (including Kyrgyzstan) and Turkey	GEF USD 75 970 550	FAO	2018–2023	Priority: improving resilience to responding to climate change, crises and disasters. Results: climate change mitigation and adaptation in the agricultural and forestry sectors, as well as increased resilience to disasters and crisis situations; promoting climate-friendly agriculture, including pastures, and sustainable land and water management in drylands ( <a href="https://www.thegef.org/project/integrated-natural-resources-management-drought-prone-and-salt-affected-agricultural">https://www.thegef.org/project/integrated-natural-resources-management-drought-prone-and-salt-affected-agricultural</a> ).
Improving agricultural productivity and nutrition	Kyrgyzstan	Global Program for Agriculture and Food Security (GAFSP) USD 38 000 000	State Water Resources Agency (former Department of Water Management and Land Reclamation of the MAWRRD)	2016–2022	The goal of the project is to increase agricultural productivity and food security and nutrition for the rural population in selected areas of the country. The project consists of four components: 1) rehabilitation and modernization of drainage and irrigation infrastructure; 2) agricultural advisory services; 3) measures to improve the quality of nutrition; and 4) project management ( <a href="https://www.gafspfund.org/projects/agriculture-productivity-and-nutrition-improvement-project-apnip">https://www.gafspfund.org/projects/agriculture-productivity-and-nutrition-improvement-project-apnip</a> ).
Central Asia Hydrometeorology Modernization Project	Central Asia, including Kyrgyzstan	World Bank and Climate Investment Funds USD 27 700 000	Kyrgyzhydromet, International Fund for saving the Aral Sea	2011–2023	The development objective of the project is to improve the accuracy and timeliness of hydromet services in Central Asia, with particular focus on Kyrgyzstan and Tajikistan. The project will provide positive social benefits by increasing the volume and quality of hydrometeorological information and early warning services. ( <a href="https://projects.worldbank.org/en/projects-operations/project-detail/P120788?lang=en&amp;tab=procurement&amp;subTab=notices">https://projects.worldbank.org/en/projects-operations/project-detail/P120788?lang=en&amp;tab=procurement&amp;subTab=notices</a> ).

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Promoting the development of a National Adaptation Plan for medium and long-term planning and implementation of adaptation in the Kyrgyz Republic	Kyrgyzstan		UNDP		The project supports the Government of the Kyrgyz Republic in the development of the National Adaptation Plan and is in line with the government's strategic vision for adaptation to climate change. Its goal is to strengthen institutions and improve vertical and horizontal coordination of adaptation planning for climate change, to facilitate the integration of climate risks at sectoral and subnational levels, and to define a programme of priority investments in adaptation to climate change. ( <a href="https://www.globalsupportprogramme.org/projects/supporting-kyrgyz-republic-advance-their-nap-process">https://www.globalsupportprogramme.org/projects/supporting-kyrgyz-republic-advance-their-nap-process</a> ).
Increased resilience to mudflows in communities in southern Kyrgyzstan.	Kyrgyzstan		UNDP		The project aims to enhance the climate resilience of local farming communities by: 1) increasing the ability of the government to model and predict mudflows; 2) climate resistant irrigation canals using modern protective measures; and 3) improving policies, rules and building codes for the construction and maintenance of irrigation canals in a changing climate. Investment in the project will benefit 50 000 small-scale farmers by protecting the climatic impacts of irrigation canals and 200 000 people by protecting agricultural land, roads, and settlements from damage from mud flows.
Improving resilience to climate change in the Batken Oblast of the Kyrgyz Republic through the introduction of climate-friendly irrigation measures and protection from mud flows	Kyrgyzstan		UNDP		The project aims to increase resilience and reduce climate change damage in targeted agricultural communities in the Batken region of Kyrgyzstan, which is the most vulnerable region in the country to the effects of climate change. Vulnerability reduction will be achieved by fully promoting complementary solutions, replicating and expanding climate-change adaptation practices that have been successfully tested by UNDP in areas such as agriculture, water resources and DRR.
Creation of a network on priority livestock diseases in Central Asia (PLDCA)	Central Asia, including Kyrgyzstan		FAO		Priority: Gender-responsive policies and programmes for agriculture, food security and nutrition, social protection and rural development. Results: 1) sectoral policy has been developed for the effective implementation in accordance with the national long-term goals, and the relevant management capacities in the field of animal health, fisheries and aquaculture have been strengthened. 2) programme of the Government of the Kyrgyz Republic "Development of the veterinary service of the Kyrgyz Republic for 2018–2023" dated 17 October 2017 No. 673. 3) State strategy to combat brucellosis ( <a href="http://www.fao.org/europe/event/detail-events/ru/c/1238324/">http://www.fao.org/europe/event/detail-events/ru/c/1238324/</a> ).

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Project for improvement of locust management	Afghanistan, Kyrgyzstan and Tajikistan	Japan/Japan International Cooperation Agency (JICA) USD 4 852 280	Department of Chemistry and Plant Protection, MAWRRD	2015–2019	The project will contribute to food security and livelihoods of the rural population by preventing and limiting threats from locusts and damage to crops and rangelands in relation to human health and the environment. The expected outcome of the project is improved locust control at the national and regional levels in Afghanistan, Kyrgyzstan and Tajikistan and in neighbouring countries through the development of national capacities and regional cooperation. ( <a href="http://www.fao.org/3/BU327en/bu327en.pdf">http://www.fao.org/3/BU327en/bu327en.pdf</a> ).
Project for Improvement of Locust Management (Phase 2)	Central Asia (including Kyrgyzstan) and Afghanistan	Japan/Japan International Cooperation Agency (JICA) USD 7 227 723	Department of Chemistry and Plant Protection, MAWRRD	2020–2025	The overall objective of the project is to contribute to food security and livelihoods of the rural populations in Central Asia by preventing and limiting the threats posed by locusts and damage to crops and rangelands in the respect of human health and the environment. The expected outcome of the project will be that national and regional locust management is improved through development of increased national capacities and more efficient regional cooperation. ( <a href="http://www.fao.org/3/cb1302en/cb1302en.pdf">http://www.fao.org/3/cb1302en/cb1302en.pdf</a> ).
Preparedness and emergency response to locust infestations	Kyrgyzstan	FAO USD 250 000	Department of Chemistry and Plant Protection, MAWRRD	2020–2021	The objective was to support locust management during the 2020 and 2021 campaigns and to reduce the extent of locust infestations and related threats at the national level and for the neighbouring countries. Project will support the operational capacities of the services in charge of locust management for conducting locust survey, control and pesticide risk reduction, as well as to further strengthen their human capacities.
Locust disaster risk reduction in Caucasus and Central Asia (CCA)	Central Asia (including Kyrgyzstan), Afghanistan, Armenia, Azerbaijan, Georgia, Russian Federation	USAID USD 480 000	Department of Chemistry and Plant Protection, MAWRRD	2018–2021	The overall objective of the project is to contribute to food security and livelihoods of rural populations in climate-change adaptation by anticipating, preventing and limiting the threat posed by locusts, i.e. reducing occurrence and intensity of locust crises as well as of their potential impacts on crops and rangelands and on human health and the environment in case they occur. The expected outcome of the project is that locust management is improved in climate-change adaptation and more specifically that early warning and reaction are enhanced thanks to appropriate locust monitoring as well as better capacities to respond to locust infestations, with particular attention to human health and environment. ( <a href="http://www.fao.org/3/CA3377EN/ca3377en.pdf">http://www.fao.org/3/CA3377EN/ca3377en.pdf</a> ).
Towards better national and regional locust management in Caucasus and Central Asia	Central Asia (including Kyrgyzstan) and Azerbaijan	Government of Turkey USD 600 000	Ministry of Agriculture	2014–2019	The objective of the project is to contribute to safeguard food security and livelihoods of rural populations in Caucasus and Central Asia by preventing, controlling and limiting the threats posed by locusts to crops and rangelands. The outcome of the project will be the improvement of national capacities as well as the coordination of the overall programme in six countries for better national and regional locust management. ( <a href="http://www.fao.org/3/BU325en/bu325en.pdf">http://www.fao.org/3/BU325en/bu325en.pdf</a> ).

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Enhancing locust management and prevention	Central Asia (including Kyrgyzstan), Caucasus, Russian Federation, Afghanistan	United States Agency for International Development (USAID) USD 1 660 000	Ministry of Agriculture and National Locust Control Unit	2011–2017	The project aimed to improve national and regional locust management, to reduce the occurrence and intensity of locust outbreaks; as well as to protect human health and biodiversity through the reduction of risks associated with obsolete and useable pesticides. ( <a href="http://www.fao.org/3/bu326e/bu326e.pdf">http://www.fao.org/3/bu326e/bu326e.pdf</a> ).
Providing access to markets	Kyrgyzstan	IFAD, Russian-Kyrgyz Development Fund, Kyrgyz Government USD 55 550 000	Department of Pasture, Livestock and Fisheries ?	2016–2023	The goal of the project is to promote growing income and overall economic growth of pasture communities. The objectives of the project are to improve the access and integration of small livestock producers in profitable markets for the sale of their products, which ultimately will lead to increased income and a more equitable distribution of income along the chain. The objective of this component is to achieve efficiency and increase the profitability of participants by providing them with access to external credit lines and developing and implementing innovative financial products. The project also focuses on the modernization of the livestock sanitation system of Kyrgyzstan. The project developed an EWS for distress in remote pastures. ( <a href="https://www.ifad.org/en/web/operations/project/id/2000001232">https://www.ifad.org/en/web/operations/project/id/2000001232</a> ).
Livestock and Market Development Programme II	Kyrgyzstan	IFAD USD 39 530 000		2013–2020	The aim is to reduce poverty and enhance economic growth in pasture communities by improving livestock productivity and climate resilience – and thereby promoting equitable returns to livestock farmers. The target area consists of three southern regions – Batken, Jalal-abad and Osh. Main components: community-based pasture management and vulnerability reduction; effective private veterinary system; income diversification and market/value chain initiatives. <a href="https://www.ifad.org/en/web/operations/project/id/1100001709">https://www.ifad.org/en/web/operations/project/id/1100001709</a>
Climate services and diversification of climate sensitive livelihoods to empower food insecure and vulnerable communities in the KR	Kyrgyzstan	Green Climate Fund (GCF) USD 9 600 000	World Food Programme (WFP)?	2018–2022	The project aims to support the Government of the Kyrgyz Republic to reduce vulnerability to climate change and to increase the adaptive capacity and resilience of rural communities in Osh, Batken and Naryn provinces, which are increasingly affected by climate change impacts and suffer from low adaptive capacity. ( <a href="https://www.greenclimate.fund/project/sap002#details">https://www.greenclimate.fund/project/sap002#details</a> ).
Enhancing the Capacity of Developing Countries of Central Asia for the Effective Use of Space Applications for Drought Monitoring and Early Warning through the Regional Drought Mechanism	Central Asia including Kyrgyzstan	Government of Russia Federation; ESCAP	United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)	2019–2020	As part of this project, the Center for Emergency Situations and Disaster Risk Reduction (CESDRR) in Almaty, in collaboration with the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), plans to conduct an expert assessment of drought problems and various existing drought monitoring models in Central Asia. ( <a href="https://www.unescap.org/events/team-building-meeting-effective-use-space-applications-drought-monitoring-central-asia">https://www.unescap.org/events/team-building-meeting-effective-use-space-applications-drought-monitoring-central-asia</a> )

Title of programme / project	Targeted countries	Funding agency, total budget	Implementation agency	Implementation period	Main components/project aim
Integrated Natural Resources Project of FAO-GEF	Kyrgyzstan	FAO	CAMP Alatoo Public Foundation		The projects cover aspects such as interaction on greening drylands, combating desertification, land degradation and drought, preserving biodiversity, restoring and rehabilitating forests of degraded lands ( <a href="http://camp.kg/publikacii-i-otcheti.html">http://camp.kg/publikacii-i-otcheti.html</a> ).
Afforestation of Dry Lands through Support to Rural and Forest Nurseries	Kyrgyzstan	UN Convention to Combat Desertification (UNCCD) / Forest Service of Korea USD 100 000	CAMP Alatoo Public Foundation	2018–2021	The afforestation of forest and rural dry lands is being carried out throughout Kyrgyzstan. This requires a large amount of the relevant planting materials, which can be produced in rural and forest plantations. The CAMP Alatoo studies have revealed the deficit in seedlings produced by the forestry enterprises, and thus, there is a need for more nurseries. Products of the rural nurseries are also in demand among the population.
Strengthening Regional Collaboration and National Capacities for Management of Wheat Rust Diseases (CAC-Rust)	Central Asia, including Kyrgyzstan	FAO-Turkey Partnership Programme, USD 1 067 000	FAO	2020–2024	Regional collaboration, monitoring, surveillance, race analysis, development of national strategic programme for prevention and management and capacity development.

ISBN 978-92-5-135683-8



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CB8418EN/1/02.22