



Requirements Analysis Report

1. Introduction

Environmental protection (EP) and disaster risk management (DRM) are one of the main issues that are rapidly increasing and need to be taken care of in Central Asian countries, not least Uzbekistan and Kyrgyzstan. Organizations (mainly governmental), who are in charge of that have been using traditional methods and techniques. More specific and considering the role of spatial information science and technologies (SIST) to facilitate EP & DRM, experts in charge need to improve their level of knowledge and skills on using SIST for EP & DRM. They also need easy access to proper tools for the management of spatial data as well as spatial analysis for a better decision-making.

2. Aim

Two main aims of the need analysis in line with the main objectives of the project are:

- Identifying the most important EP & DRM issues in Uzbekistan and Kyrgyzstan to be used for the development of the innovative courses.
- Identifying the basic GIS requirement for the development of iMSEP.

3. Methodology

Visiting organizations, interview with experts and filling questionnaires were used together for the requirement analysis. The questionnaires were developed by EPCA participants during the kick-off meeting to collect information and identify need analysis (Annex-1). The organizations and the experts who were visited/interviewed are listed in annex-2 and annex-3. The meetings were held during the period 2018-02-12 to 2018-03-19.

4. Results

The results of the need analysis are aggregated for each country (Uzbekistan and Kyrgyzstan).

Results in scope of Uzbekistan

ANSWERS FOR QUESTIONNAIRE 1:

1. How do you do environmental protection?

Bureau of Ecology and Environmental Protection of Uzbekistan (BEEP UZ) and its Khorezm branch (Kh BEEP), Ecology and Environmental Protection organization of Karakalpakstan (EP Kr): environmental protection (EP) issues are based on governmental rules and regulations, periodic and continuous governmental instructions. Strategic, annual and monthly plans of activities are developed for environmental protection in each regional branch according to the features and character of the region.

Ministry of Emergency Situations of Uzbekistan (MES UZ), Research Institute of Emergency Situations of Uzbekistan (RI ES UZ): Protecting actions are based on continuously monitoring, analyses, and evaluations. Actions are carried out by field studies, and sometimes by satellite images. Accordingly, decisions and protection activities plans are developed.

Hydro-meteorological Scientific-Research Institution of Uzbekistan (HMetSRI): EP actions are based on continuous monitoring, scientific-research works, scientific and practical experiences.

Eco-Movement of Uzbekistan (ECOYZ): Reports and scientific information of the relevant organizations are collected by comments of society, and individuals' opinions, information are analyzed. Generalized suggestions are submitted to the Parliament of Uzbekistan. According to the decisions annual and monthly plans are developed and activities will be clarified.

Hydro-meteorology organization of Karakalpak Republic (HMetOKr): EP related information are collected by hydro meteorological stations and through field expeditions. They are analyzed and submitted to the relevant ministries. All EP activities are discussed and instructions are provided and annual plans will be developed.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute (KLSRI): Erosion, soil improvement issues, and soil ecological conditions are investigated every 5 years in irrigated lands and every 10 year in non-irrigated lands. EP plans are developed and contracts with farmers for harvesting are signed according to the results.

Land Resource and State Cadastre Bureau of Karakalpakstan (LRSCK): Main EP activities are the followings: rational use of land resources, protecting land from degradation, improvement land use conditions. They are regularly monitored by the organization. In general, all activities are indicated in Land Codex of the Republic of Uzbekistan.

2. How do you do disaster risk reduction?

Bureau of Ecology and Environmental Protection of Uzbekistan and its Khorezm branch, Ecology and Environmental Protection organisation of Karakalpakstan (EP Kr): The areas known as disastrous are regularly controlled by field studies, expeditions, and monitoring activities together with relevant organizations. As a result, source of disasters are identified, reports are presented to a relevant ministry. After analyzing the information

recommendation and explanations will be developed. If source of disasters is a natural person or a juridical organization, they will be warned, and fined.

Ministry of Emergency Situations of Uzbekistan (MES_UZ), Research Institute of Emergency Situations of Uzbekistan (RI_ES_UZ), Khorezm regional branch of Emergency Situations of Uzbekistan (Kh_ES): list of the disasters known by experiences are continuously monitored. Disaster risk maps, mitigating plans, regular set of activities are developed by the result of monitoring. Disasters are modeled and mapped.

River floods and their eroding are monitored by visiting the places in Khorezm region. These processes are under continues control. Agricultural lands and their water use norms will be controlled during the drought and all governmental and NGOs will be involved to this event. Explanations among farmers and society will be held through TV, radio channels and by public meetings.

Hydro-meteorological Scientific-Research Institution of Uzbekistan (HMetSRI): The list of disasters known from previous experiences, and plans of disaster risk reduction activities are presented after continues monitoring. As the result, society are regularly informed about disasters such as avalanches, surface run off, drought, extreme weather conditions. Prophylactic measures will be developed.

Eco-Movement of Uzbekistan (ECOUZ): Reports and scientific information of the relevant organizations are collected by comments of society, and individuals' opinions, information are analyzed. Generalized suggestions are submitted to the Parliament of Uzbekistan. According to the decisions annual and monthly plans are developed and activities will be clarified.

Hydro-meteorology organization of Karakalpak Republic(HMetOKr): disasters such as flood, dust storms, drought and river freezing are continuously monitored and relevant state organizations are informed. Subsequently, action plans are developed.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute (KLSRI): the main EP activities are focused on protecting irrigated lands from flood and wind erosion, surface run off, water erosion. Drought and river eroding processes are regularly controlled.

3. What kind of natural disasters do you work with? Please rank them according to the importance of your country (1-5, where 1 is most important)!

Types of natural disasters	EEP_UZ	Kh_B_EEP	MES_UZ	RI_ES_UZ	Kh_ES	HMetSRI	ECOUZ	HMetOKr	KLSRI	LRSC_K	EP_Kr
Landslides	1		2	5		2	4				
Flooding	2	2	1	5	1	1	2	1	1	3	1
Air pollution	4		3	3	3		3				2
Water pollution	3	3	3	3	3		3				2
Garbage polygons	4		2	3	2		2			2	3
Earthquake	4		2	5	5	3	5				
Avalanches	4		2	4		1	3				
Drought	1	1	1	3	1	2	1	1	1	1	1
Desertification	3	3	3	2	2	2	1	2			2
Others:	5		5		3	3	5				

-Surface runoff in mountainous areas				5								
- Forest fire				5								
- Extreme weather changes				4					2	2		4

4. What types of topics and practical works on environmental protection should be discussed?

Offered topics	EEP_UZ	Kh_B EEP	MES_UZ	RI_E S_U Z	Kh_ES	HMet SRI	ECO UZ	HMetO Kr	KLSR I	LRSC K	EP_K r
Water erosion	√	√	√		√		√		√	√	
Wind erosion	√	√	√				√		√	√	
Desertification	√		√	√	√	√	√	√		√	√
Deforestation	√	√	√		√			√	√		√
Mountain glaciers movement and monitoring	√		√	√		√		√			
Soil salinization	√	√	√	√		√	√	√	√	√	√
Land cover monitoring	√	√	√		√	√	√		√	√	√
Ecosystem monitoring		√					√				√
Air pollution	√	√	√	√	√	√	√	√			√
Water pollution	√	√	√	√	√	√	√	√			
Others: - Communal garbage management - surface runoff - flood - landslides - earthquake - Aral Sea problem - Drinking water problem in Aral Sea region - Trans boundary river water use - Garbage utilization											
		√	√	√	√	√			√		√
							√	√			

5. What kind of topics of disaster risk management related to GIS, RS and Spatial Data Infrastructure do you want to be taught?

Offered topics	EEP_UZ	Kh_BE EP	MES_UZ	RI_ES_UZ	Kh_ES	HMe tSRI	ECO UZ	HMet OKr	KLSRI	LRSC K	EP_Kr
Remote sensing for soil degradation	√	√	√		√	√		√		√	√
Remote sensing for monitoring the environment and land cover	√	√	√	√	√		√	√	√	√	√

Spatial analysis for ecological threatened areas/hot spots	√	√	√	√	√	√	√	√	√	√	√
Natural disaster risk analysis by spatial analysis	√		√	√	√	√	√	√			√
GIS and RS for data acquisition and storage	√	√	√	√	√	√		√	√	√	√
Spatial data infrastructure for data sharing	√		√	√	√	√		√	√	√	√
GIS for spatial analysis	√		√	√	√	√				√	√
Others: -GIS types and their application	√		√	√	√						√

6. What are the indicators related to natural disasters? Which influencing factor(s) of natural disasters do you investigate?

Bureau of Ecology and Environmental Protection of Uzbekistan and Ecology and Environmental Protection organisation of Karakalpakstan: various indicators of natural disasters are investigated related to atmosphere, hydrosphere, and biosphere within different regions of the country. Here some main parts of them:

1. Underground and surface water, lake and reservoirs water tables, salinity, pollution with different chemicals etc.
2. Climatic indicators such as temperature increase and decrease, dust storms, air pollution etc.
3. Protecting biodiversity by controlling illegal hunting and breeding, deforestation and desertification by monitoring vegetation cover, garbage polygons etc.

Khorezm branch of Ecology and Environmental Protection:

1. River water table change, amount, speed, salinity.
2. Forest cover/area by field trips and Google images.
3. Illegal fishing and hunting activities.
4. Points/source of waste water pollutions.
5. Movements of sand dunes and masses.
6. Dynamics of lakes, their area and biodiversity, anthropogenic impact.
7. Area of communal garbage polygons.
8. Number of days with dust storm, and their direction, content.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: All indicators of natural disasters that have direct influence to the society are investigated. They are climatic factors like weather temperature, wind speed, precipitation, and volume of avalanches, flood area and speed, earthquake, and earthquake intensity and others.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Avalanches; their mass, area and movements, surface run off and flood; volume, speed, and area, directions, river eroding etc.

Eco-Movement of Uzbekistan: Aral Sea shrunk area, dust storms in Aral Sea area, melting

of mountain glaciers by Aral Sea salt, Global Climate Change.

Hydro-meteorology organization of Karakalpak Republic: Meteorological information related to natural disasters.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute: River eroding process, soil salinization are the main interest.

Land Resource and State Cadastre Bureau of Karakalpakstan: Soil salinisation and erosion are the main interest.

7. Do you use GIS in your daily work?

Bureau of Ecology and Environmental Protection of Uzbekistan: Yes. GIS is used for monitoring communal garbage polygons, air pollution, and underground water table, soil salinisation, general controlling of environmental protecting activities etc.

Khorezm branch of Ecology and Environmental Protection: Yes. GIS is used for monitoring communal garbage polygons.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: Yes (around 10% of daily activities). It is used for analyzing electronic maps.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Yes (around 40-60% of daily activities). It is used for monitoring avalanches and threatened areas in mountainous areas, monitoring surface run off and flood.

Eco-Movement of Uzbekistan: No, we do not.

Hydro-meteorology organization of Karakalpak Republic and Ecology and Environmental Protection organisation of Karakalpakstan: No, we do not.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute: Yes. GIS is widely used for creating cadastre maps of farmer's lands and residential areas.

Land Resource and State Cadastre Bureau of Karakalpakstan: Yes. GIS is widely used for creating cadastre maps of residential, commercial and the other lands.

8. Do you use RS in your daily work?

Bureau of Ecology and Environmental Protection of Uzbekistan: Yes. Remote sensing data is used. For example, Google Earth images are for garbage polygons, Landsat 8 OLI/TIRS, Sentinel 2A, SRTM, ASTER, MODIS and others.

Khorezm branch of Ecology and Environmental Protection: Yes. Remote sensing data is used for developing cadastre maps of garbage polygons through Google Earth images.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: Yes (around 10% of daily activities). It is used for working with electronic maps, Google maps, satellite images, and evaluating situations, panning prophylactic measures and protective activities.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Yes. This kind of data is used for creating snow cover map in Central Asia and for the others purposes. Additionally, they are also used for meteorological analysis.

Eco-Movement of Uzbekistan and Ecology and Environmental Protection organization of Karakalpakstan: Yes. RS is used for meteorological analysis, and forecasting.

Hydro-meteorology organization of Karakalpak Republic: Yes. RS data is used for meteorological analysis.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute: Yes (10 % in daily works). Google maps are used.

Land Resource and State Cadastre Bureau of Karakalpakstan: Yes. Google maps are used.

9. What GIS and Remote sensing software do you use?

Bureau of Ecology and Environmental Protection of Uzbekistan and Ecology and Environmental Protection organisation of Karakalpakstan: ArcView, ERDAS, QGIS.

Khorezm branch of Ecology and Environmental Protection: ArcView

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: ArcView

Hydro-meteorological Scientific-Research Institution of Uzbekistan: ArcGIS 10.2, QGIS 2.18.

Eco-Movement of Uzbekistan: No, we do not use GIS.

Hydro-meteorology organization of Karakalpak Republic: ArcView

Karakalpakstan branch of Uzbek State Land Structuring Research Institute: ArcView, ArchiCAD.

Land Resource and State Cadastre Bureau of Karakalpakstan: ArcView.

10. General knowledge and skill of the workers at your organization on GIS and RS.

Level	EEP_UZ	Kh_BEEP	MES_UZ	RI_ES_UZ	Kh_ES	HMe tSRI	ECO_UZ	HMe tOKr	KLSRI	LRSCK	EP_Kr
Nothing							√				√
Low			√	√	√	√				√	
Medium	√	√						√			
High									√		
Very high											

11. Would you like to attend distance courses on GIS and RS?

Answer	EEP_UZ	Kh_BEEP	MES_UZ	RI_ES_UZ	Kh_ES	HMe tSRI	ECO_UZ	HMe tOKr	KLSRI	LRSCK	EP_Kr
Yes	√	√	√	√	√	√	√	√	√	√	√
No											

ANSWERS FOR QUESTIONNAIRE 2:

1. What kind of Spatial data do you use/or have?

Bureau of Ecology and Environmental Protection of Uzbekistan and Ecology and Environmental Protection organisation of Karakalpakstan: Google images, Landsat images, ASTER and SRTM data, MODIS images, areal photos, climatic data; National database of wild animals, Open Street Map data; GPS data, synoptic maps; ALOS, SPOT images etc.

Khorezm branch of Ecology and Environmental Protection: Google images, Landsat images.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: Google Earth images, satellite images, electronic maps available in internet, areal photos.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: NOAA-19, METEOSAT-10, MODIS AQUA, TERRA, Landsat 5-8, ASTER AND SRTM.

Eco-Movement of Uzbekistan: Google Maps, METEOSAT-10.

Hydro-meteorology organization of Karakalpak Republic: Meteorological satellite data, and areal photos are available.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute: Google maps.

Land Resource and State Cadastre Bureau of Karakalpakstan: Google maps.

2. What kind of base maps do you have? (name, scale and information content).

Bureau of Ecology and Environmental Protection of Uzbekistan and Ecology and Environmental Protection organisation of Karakalpakstan: Topographic maps (military) on different scales and 1:25000 scale maps are considered as secret maps. Complex environmental protection (EP) maps, serial EP maps, regional and protecting area maps. Some of them have in digital form. Information content differs by maps. For example, complex EP maps describe air pollution in cities, wind direction, soil degradation, protecting areas, threatened species etc. There are urban and rural cadastral maps and the others.

Khorezm branch of Ecology and Environmental Protection: topographic maps (military) on different scales, transportation maps, and environmental protection maps.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: Small, medium and large scale topographical maps (military maps), cadastre maps on different scales.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Survey topographic maps are used on medium scales of 1: 100 000 to 1: 1000 000.

Eco-Movement of Uzbekistan: City maps, survey topographic maps are used on medium scales of 1: 100 000 to 1: 1000 000.

Hydro-meteorology organization of Karakalpak Republic: The synoptic maps are used.

-AT -850 (absolute baric topography), 1.5 km.

- AT-700, 3 km.

- AT-500, 5-5.5 km.
- Temperature and precipitation extreme maps.
- Topographic maps.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute and Land Resource and State Cadastre Bureau of Karakalpakstan: large scale agricultural, cadastre and topographic maps are used.

3. What kind of maps do you have for disaster risk management?

Bureau of Ecology and Environmental Protection of Uzbekistan, and Khorezm branch of Ecology and Environmental Protection and Ecology and Environmental Protection organization of Karakalpakstan: Seismic zoning map of Uzbekistan, Synoptic maps for forecasting frost, drought, precipitation and etc., hazard maps, landslide maps, cadastre maps of disastrous areas on a scale of 1:25000. However, less of them have been digitized.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan:

- Small, medium and large scale topographical maps (military maps).
- Seismic zoning maps on a scale of 1: 1 000 000.
- Flood area maps on different scales etc.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Avalanches and surface run off maps of Uzbekistan that created through long time investigations. Survey topographic maps are used on medium scales of 1: 100 000 to 1: 1000 000.

Eco-Movement of Uzbekistan: City maps, survey topographic maps are used on medium scales of 1: 100 000 to 1: 1000 000.

Hydro-meteorology organization of Karakalpak Republic: The synoptic maps and topographic maps are used.

4. What kind of maps do you have for environmental protection and management?

Bureau of Ecology and Environmental Protection of Uzbekistan, and Khorezm branch of Ecology and Environmental Protection and Ecology and Environmental Protection organisation of Karakalpakstan: Complex environmental protection (EP) maps, serial EP maps, regional and protecting area maps.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: Topographic maps of the country on different scales.

Hydro-meteorological Scientific-Research Institution of Uzbekistan:

- Map of the area threatened with avalanches.
- Map of the area threatened with surface run off.

Eco-Movement of Uzbekistan: Google Maps, Eco-touristic map of Uzbekistan, Environmental protection maps of Uzbekistan, Geo – ecological map of Lower Zarafshan region, Garbage areas map of Uzbekistan, survey topographic maps are used on medium scales of 1: 100 000 to 1: 1000 000.

Hydro-meteorology organization of Karakalpak Republic: The synoptic maps and

meteorological maps are used.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute and Land Resource and State Cadastre Bureau of Karakalpakstan: large scale agricultural, cadastre and topographic maps are used.

5. Is your data secret or available for use and/or publication?

Bureau of Ecology and Environmental Protection of Uzbekistan and Ecology and Environmental Protection organization of Karakalpakstan: Available, and there are secret information too.

Khorezm branch of Ecology and Environmental Protection: Available and not secret.

Ministry of Emergency Situations of Uzbekistan, Research Institute of Emergency Situations of Uzbekistan, Khorezm regional branch of Emergency Situations of Uzbekistan: There are some secret maps too.

Hydro-meteorological Scientific-Research Institution of Uzbekistan: Only within the organization. So, they are not for public. However, there is less study and open maps for public use.

Eco-Movement of Uzbekistan: All materials are just for public and governmental use, teaching, schools, college and lyceums.

Hydro-meteorology organization of Karakalpak Republic: The meteorological data that are regularly collected is open to public and are submitted to the main meteorological stations.

Karakalpakstan branch of Uzbek State Land Structuring Research Institute and Land Resource and State Cadastre Bureau of Karakalpakstan: Yes. They are secret maps.

6. Which functionalities do you expect from iMSEP?

Functions	EEP_UZ	Kh_B EEP	MES _UZ	RI_E S_U Z	Kh_E S	HMe tSRI	EC OU Z	HMet OKr	KLS RI	LRSCK	EP_Kr
Digitizing maps	√	√	√	√	√	√	√	√	√	√	√
Storing attributes	√	√	√	√	√	√	√	√	√	√	√
Uploading data	√	√	√	√	√	√	√	√	√	√	√
Create a database; joint management database;	√	√	√	√	√	√	√	√	√	√	√
exchange of information;	√	√	√	√	√	√	√	√	√	√	√
Basic spatial analysis; High quality cartographic presentation	√	√	√	√	√	√	√		√	√	√
User guide	√	√	√	√	√	√	√		√	√	√
Sharing the data	√	√	√	√	√	√	√		√	√	√

7. Do you have an internet connection?

Answer	EEP_UZ	Kh_B_EEP	MES_UZ	MES_UZ	RI_ES_UZ	Kh_ES	HMetSRI	ECO_UZ	HMetOK_r	KLS_RI	LRSCK	EP_Kr
Yes	√	√	√	√	√	√	√	√	√	√	√	√
No												

Results in scope of Kyrgyzstan:

ANSWERS FOR QUESTIONNAIRE 1:

1. How do you do environmental protection?

Central-Asian Institute for Applied Geosciences (CAIAG) - environmental protection is a complex multidisciplinary process. Special attention is paid to the integrated, remote and ground monitoring of sources of formation and to the negative propagation of dangerous changes in the natural and natural-technical environment, and to the modeling of natural processes. Geological and geographical natural environments are studied in order to develop measures to reduce geo-hazard in the field of geodynamics, climate change, degradation of glaciers, socio-economic and water issues.

Ministry of Emergency Situations of KR:

- Department for Emergency Situations monitoring and forecasting - daily processing of the received data serves for developing actions of expeditious response to emergency situations in KR. Issue a warning on emergency situations to the population and state bodies works through system of the notification. Radio ecological monitoring of uranium and toxic tailings and rock dumps are regularly monitored.
- Hydro meteorological Agency monitors meteorological, hydrological (state of surface waters of the Kyrgyz Republic, analysis of water samples), and agro-meteorological conditions, and atmospheric air. The Agency processes the obtained results and creates a database of information. It uses this database of information to inform state bodies and all interested parties.

State Agency for Environment Protection and Forestry under the Government of the KR collects and processes data on the state of the forest Fund; creates and processes a database of forest resources; collects and analyzes taxation, geodetic and cartographic materials of the forest management. It also creates digital models of cartographic materials, develops forest management projects, and assesses forest areas. It monitors dynamic changes of forests, designs and performs calculations on the rational and long-term use of them in the south of Kyrgyzstan. It also monitors deforestation, the grazing control from pests, and diseases of the forests.

National Academy of Sciences of the KR investigates and monitors the degradation of mountain ecosystems, earthquakes, the geological structure of the territory of the country, and groundwater abstraction, irrigation systems (using GIS technology and remote sensing). It also develops scientifically proven recommendations for rational use and the preparation of forecasts. The National Academy also creates a local database to collect, process, store, display, and share information on above mentioned issues.

Public Association "Central Asian Alliance for Water" (CAAW) contributes to the formation of a healthy community and an improvement of living standards through the introduction of new technologies in providing pure drinking and irrigation water, preserving the environment, and promoting sanitation and hygiene in the Fergana Valley. CAAW realizes the following activities: focus on basic and comparative large-scale researches, as well as

the area of drinking and irrigation water, and adequate sanitation; work with databases and drafting GIS mapping; introduction of low-cost models and innovative practices in the field of solving problems associated with a shortage of water resources; introduction of innovative methods and practices in the area of environmental protection and food security.

Kyrgyz Head Institute of Geotechnical Investigations (Osh branch) carries out research to eliminate floods in the city of Osh, and conducts survey work on the river coastal protection zones. It also creates topographic and geodetic maps and other data on the terrain, as well as on existing buildings and structures that are needed to assess the anthropogenic and technogenic conditions of the construction site.

Kyrgyz State Design Institute for Land Administration (Osh branch) performs a set of design and studies land management, and land-cadastral work throughout the republic, regardless of the ownership forms of economic entities, as well as under a direct contract with individuals and legal entities.

Universities of the Kyrgyz Republic (KR) provide training for theoretical and practical courses. The students at the universities conduct research in order to write scientific and master's works. The students obtain internships in leading organizations and government agencies. The universities in Kyrgyzstan also provide training for specialists who work in the field of environmental protection.

2. How do you do disaster risk reduction?

Central-Asian Institute for Applied Geosciences (CAIAG) development programs are introduced (in the framework of the strategy of development of CAIAG. Project resources are developed. Meetings and discussions with stakeholders are held to create multi-disciplinary networks and systems of environmental monitoring (for example, a network of seismic stations, weather stations, hydrological stations, GPS measuring points) the observation of dangerous processes and phenomena. Geo-monitoring sites and early warning systems to protect the population from natural disasters and catastrophes are created. All of the received (on-line) monitoring information is submitted to the Ministry of Emergency Situations of the Kyrgyz Republic and stakeholders to reduce disaster risks and the vulnerability of the population to emergency situations. Several projects have been conducted such as climate change, using environmental monitoring network on automatic hydro-meteorological stations and modeling of natural processes.

Ministry of Emergency Situations of KR uses the allocated funds from the state budget to carry out emergency and recovery works on the maintenance of hydraulic engineering constructions, tailing dumps, mountain dumps in working condition (cleaning, repair work). This organization has good cooperation with IAEA (International Atomic Energy Agency), EU, UN agencies, the state corporation of Russian Federation "ROSATOM" etc. and implements a number of international projects. A set of measures such as trainings, seminars (for the local community, ministry employees, students of the training center) and other activities to disaster risk reduction have been developed.

- Department for Emergency Situations monitoring and forecasting:
 - conducts monitoring and issues a short-term, a long-term forecast about the possible activation of dangerous natural processes and phenomena;
 - integrates engineering and geological research in specific areas under the dangerous natural and technogenic processes and phenomena with subsequent conclusions. The conclusions are used for taking preventive measures;
 - promotes and disseminates knowledge in the field of the population and the territory protection from emergencies through conferences, seminars and other events;
 - drafts geological mapping based on topographic maps and space images of the p65+locality revealing the ways of movement of natural threats.
- Hydro meteorological Agency - conducts monitoring to prevent atmospheric hazards, floods, avalanches, and high-altitude breakthrough lakes (24 stations throughout the territory of the Kyrgyz Republic). It also informs government agencies and all interested parties about these hazards and also controls the balance of the reservoirs and rivers.

State Agency for Environment Protection and Forestry under the Government of the KR studies landslide processes. Landslide protection is provided by planting forests, and it is considered as useful to combat avalanches, arranging fire strips, and the other measures. Followings are considered as the main activities: annual monitoring of forest resources and monitoring of deforestation and grazing, identification and elimination of pest outbreaks and diseases of forest plantations.

National Academy of Sciences of the KR tests new forms of technologies on drip irrigation, automated control system of irrigation on the basis of modern information technologies of data collection and transmission, and maps seismic zoning of Kyrgyzstan, glaciers, mountain ecosystems, and the others.

Public Association “Central Asian Alliance for Water” (CAAW) carries out various measures to strengthen the capacity among government agencies as local governments in rural areas through joint planning and preparation of a plan to ensure the safety of rural water supply and sanitation. CAAW also assists in drawing up electronic maps and marking possible risk zones using program GIS mapping. This organization also works with the Center for Training and Retraining Lifeguards within the Emergencies Ministry framework to teach and train the rural population to deal with the possible types of emergencies.

Kyrgyz State Design Institute for Land Administration (Osh branch) – carries out scientific researches to liquidate of floods in Osh city and reduces the risks of this disaster. The Institute also determines and forecasts the probability of the occurrence of dangerous geological processes that could have an impact on the environment and predicts their change.

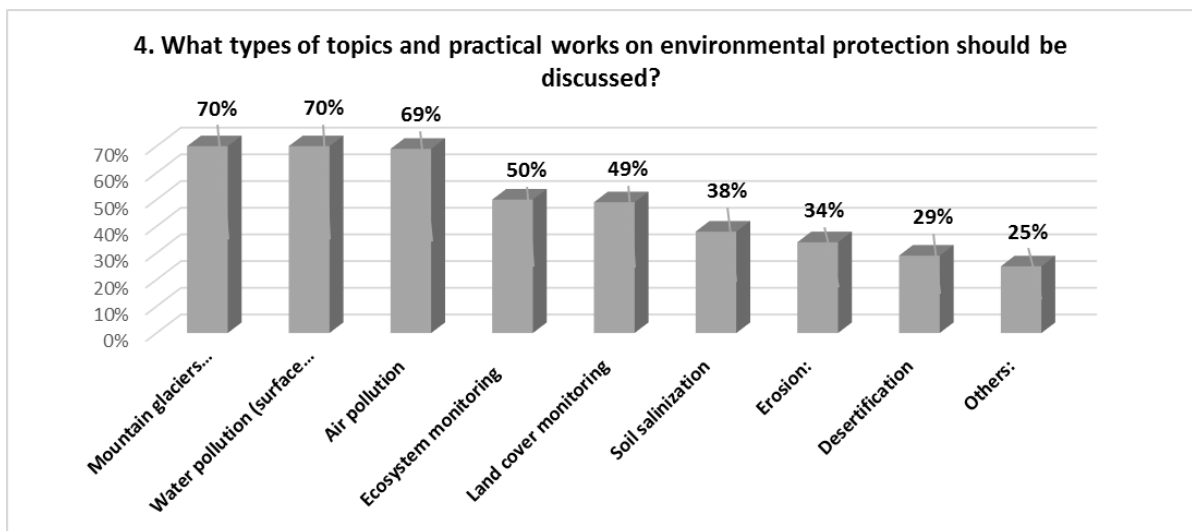
Universities of the Kyrgyz Republic (KR) – introduce new courses to the curriculum of students. The curriculum is developed by the writing and execution of research projects for students in the field of environmental protection. Additionally, trainings, seminars, and conferences are organized on disaster risk reduction.

3. What kind of natural disasters do you work with? Please rank them according to the impact that they have on your country (1-5, where 1 is most important)!

Rank	%	Types of natural disasters
1	50%	Landslide
2	40%	Earthquake
3	38 %	Pollution: air pollution / air pollutants from transport; contamination of surface waters; garbage; radioactive contamination.
4	36%	Avalanches
5	32 %	Drought
6	26%	Flooding / (Flooding of irrigated lands)
7	23%	Desertification
8	10%	Other: degradation of glaciers; pasture degradation; soil erosion/salinity; radiation ecology.

4. What types of topics and practical works on environmental protection should be discussed?

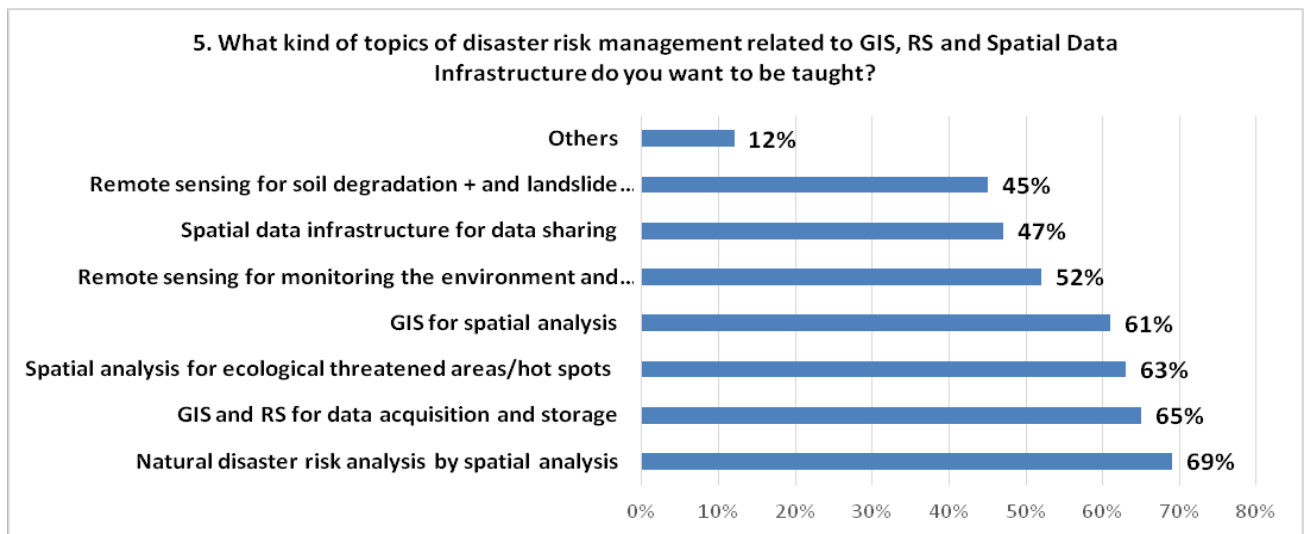
%	Offered topics
70%	Mountain glaciers movement and monitoring
70%	Water pollution (surface waters)
69%	Air pollution
50%	Ecosystem monitoring
49%	Land cover monitoring
38%	Soil salinization
34%	Erosion: water erosion; wind erosion; soil erosion/landslides.
29%	Desertification
25%	Others: melting of glaciers; radioactive vaults; pasture degradation; the threat of a dam break



5. What kind of topics of disaster risk management related to GIS, RS and Spatial Data Infrastructure do you want to be taught?

%	Offered topics
69%	Natural disaster risk analysis by spatial analysis
65%	GIS and RS for data acquisition and storage
63%	Spatial analysis for ecological threatened areas/hot spots
61%	GIS for spatial analysis

52%	Remote sensing for monitoring the environment and land cover
47%	Spatial data infrastructure for data sharing
45%	Remote sensing for soil degradation + and landslide dangerous slopes
12%	Others: create a platform of geo-database according to the remote sensing of the environment (the territory of Kyrgyzstan); GIS and household waste; river basin pollution; remote sensing and dynamics of the Tien Shan glaciers; the degradation of glaciers; indicators for spatial data; modeling (the modeling); air pollution in cities; hydrological modeling; flood analysis; earthquake; water management.



6. What are the indicators related to natural disasters?

High seismicity, active tectonics, global warming, degradation of glaciers, high level of technogenic pressure on the natural environment, and mountainous terrain (high-energy relief mountains) are considered as the main indicators. Kyrgyzstan is one of the most vulnerable countries to natural disasters in Central Asia; more than 70% of the territory is occupied by high mountains (on average from 2000 to 5500 m). Kyrgyzstan ranks 2nd in Central Asia (after Tajikistan) in terms of fresh water reserves, which are concentrated in the rivers and lakes of the country and takes a leading position in providing water to other countries of the Central Asian region. 4% of the country's territory is occupied by glaciers and eternal snow. There are 51 tailing ponds (35 uranium and 16 toxic tailing ponds) in the territory of Kyrgyzstan. There are also 25 rock dumps and substandard ores (prone to displacement by wind, by water and gravitation powers). A large part of the tailing pond went without technical observation and control for a long period of time after the collapse of the USSR. Any negative effects that might arise from an emergency involving the tailing ponds could spread to neighbor countries – Uzbekistan and Kazakhstan. The fact that most of the tailing ponds are situated in regions with high seismic activity, landslides, and close groundwater occurrence, where mudslides and floods occur makes the situation more dangerous. There are about 70 kinds of natural disasters in the world; 20 of these kinds of disasters occur in Kyrgyzstan (the most common: earthquakes, snow avalanches, landslides, and groundwater flooding).

Which influencing factor(s) of natural disasters do you investigate?

- safety of more than 1000 mountain passes in terms of the road height of snow cover, air temperature, precipitation, and the probability of snow avalanches;
- climate change factors;
- rivers, lakes, reservoirs, groundwater, water consumption, surface runoff formation;
- the intensity of melting of glaciers, degradation of glaciers, decrease in glacier area;
- state of irrigated lands;
- earthquakes, earthquake foci, faults of tectonic plates;
- floods;
- hydro meteorological factors affecting natural disasters;
- tailings and landslides, washing away of radioactive material as a result of mudflows;
- landslides, floods, avalanches;
- soil degradation;
- the complex of factors leading to dangerous changes in the geological and geographical environment.
- hydrological (groundwater dynamics), hydro-meteorological (surface water dynamics), geological (forecasting soil properties dynamics), and anthropological factors.

7. Do you use GIS in your daily work?

42%	No
58%	Yes.

If yes, how do you use it?

- Scanning raster maps, post-processing, geo - referencing, vectorization of raster maps, development of a laminated card, printing in hard copy or publication in the form of interactive web maps;
- glaciers (mapping, dynamics, use, change in the area of glaciers);
- create layers on an emergency map;
- digitization of maps;
- creation of a spatial database;
- creation of electronic maps for agriculture;
- teaching students programming for Google Map;
- remote sensing data decryption;
- data collection and database structure creation;
- data storage;
- create and edit maps;
- data transformation and geo-processing;
- digitizing the terrain.
- scanning and geo-referencing raster maps;
- using geo-portals
- creation of geo-database;
- data collection and geo-database design;
- data storage;

- create and edit maps;
- delivering courses on GIS, RS;
- download satellite images for digitizing maps;
- map visualization.

8. Do you use RS in your daily work?

61%	No
39%	Yes.

If yes, how do you use it?

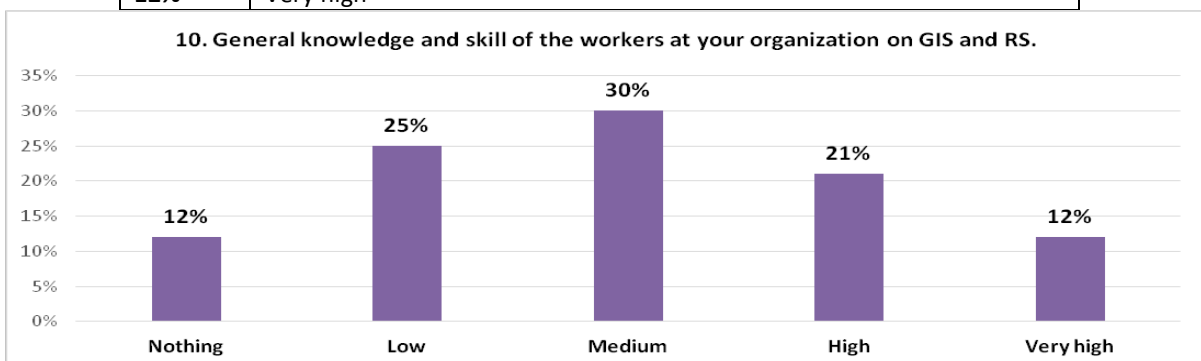
- High-resolution satellite images are used to update topographic and thematic maps. Interpretation and thematic interpretation of RS data (remote sensing) for some tasks;
- digitization of external and internal layers of forestry objects;
- fault mapping;
- relief forms;
- investigate the landslide motion for seismic hazard assessment;
- study of the melting process and changes in glacier area;
- geo-referencing raster;
- digitizing objects;
- clarify the location of the studied objects;
- clarify the state and use of irrigated lands;
- Classification of changes in the area of the study areas (controlled, uncontrolled, object-oriented).
- high-resolution satellite images are used to update topographic and thematic maps. Interpretation and thematic interpretation of RS data (remote sensing) for some tasks;
- satellite images for forest monitoring;
- using drones for land surveying
- geo-referencing raster;
- digitizing objects;
- Agriculture.

9. What GIS and Remote sensing software do you use?

#	Programs / Resources	%
1	Arc GIS (9.3-10.1); GIS; GIS 10.3; Grass GIS; Data Deskop; GIS MEO (MAP MAKERS)	77
2	QGIS; Quantum GIS 2.16.0.	71
3	Arc Map; ArcMap; Arc Scene; Arc View; Map Course; Arc Todbox; Arc Catalog.	42
4	ERDAS Imagine; ERDAS imaging.	13
5	Google Earth Pro; Google Map.	13
6	MapInfo 7	13
7	ENVI	9
8	MapInfo Professional SCP	9
9	R-studio	6
10	Global Mapper	6
11	uDig	3
12	Auto CAP	3
13	Permacart	3
14	SAS Planet	3
15	SNAP	3
16	HEC-HMS	3
17	eCognition	3
18	Access	3
19	HEC-RAS	3
20	ERSI	3
21	U.S. Geological Survey (glovis.usgs.gov)	3
22	PostgreSQL, PostGis, GeoServer, GeoExplorer, Python (http://geonode.mes.kg/)	3
23	Geodraw	3
24	Adisoft Photoscan	3

10. General knowledge and skill of the workers at your organization on GIS and RS.

12%	Nothing
25%	Low
30%	Medium
21%	High
12%	Very high



11. Would you like to attend distance courses on GIS and RS?

93%	Yes.
7 %	No

ANSWERS FOR QUESTIONNAIRE 2:

1. What kind of Spatial data do you use/or have?

- Landsat ETM the whole of Kyrgyzstan;
- ASTER GDEM the whole Kyrgyzstan;
- QuickBird-1/2, WorldView-1/2-partially;
- Mass digitization and updating of urban and rural cadastral maps;
- National database of wild animals of Kyrgyzstan;
- Satellite spatial data (raster imagery);
- OpenStreetMap data;
- GPS data (30 stations in CA);
- GeoNode database;
- Data from the observing network;
- Data from the Internet;
- Installation of satellite images HOBITUS.COM, synoptic maps (gis.meteo.ru; meteomaps.ru);
- ALOS, SPOT satellite images;
- Optical images;
- Landsat 5-8 satellite images from archives, observations of the earth's surface;
- SiSS sensor data storage system;
- GIS data on sustainable development of Issyk-Kul lake;
- Safety of schools and pre-school educational institutions in Kyrgyzstan;
- Data platform CAIAG risk of natural disasters in Kyrgyzstan;
- Electronic maps and satellite images;
- Shape files, data from the classification of remote sensing data.
- SRTM, DEM of Central Asia;
- Satellite spatial data (raster imagery);
- Shapefiles of Administrative boundaries, rivers, lakes, settlement of Kyrgyzstan;
- Small-scale land cover map of Kyrgyzstan;
- Electronic maps and satellite images;
- Specialized seismic maps;
- Shape files, data from the classification of remote sensing data.
- Large-scale topographic maps (1:500, 1:2000).
-

2. What kind of base maps do you have? (name, scale and information content).

- Topographic maps on a scale of 1:1 000 000 to 1:100 000 for whole country.
- Topographic maps of the country (on scales of 1:200 000; 1:10 000; 1:20 000; 1:50 000; 1:25 000);
- Soil maps, soil reclamation maps, soil erosion maps on a scale of 1: 50 000;
- Maps-schemes of irrigation network;
- Geological map of the country on a scale of 1: 500 000;
- Training maps on a scale of 1:25 000;
- Geomorphologic map of KR;
- Map of the epicenters of the KR earthquakes;



- Quaternary faults of the Northern Tien Shan (based on geological and tectonic maps);
- Political world map, physical world map;
- Thematic maps (small, medium, large scale) published in Kyrgyzstan and Central Asia, inventories of landslides in Osh, Jalal-Abad and Batken regions (Kyrgyzstan), published "Atlas of earthquakes in Kyrgyzstan", maps of degradation of glaciers in Kyrgyzstan (CAIAG);
- Soil maps for whole Kyrgyzstan;
- Seismic Maps for Osh city;
- Hazard map for Batken region;
- Hydrology network map.

3. What kind of maps do you have for disaster risk management?

- Map of seismic zoning of the territory of Kyrgyzstan;
- Synoptic map of the KR for the forecast of frost, drought, precipitation;
- Electronic maps and data taken from the Internet;
- Maps compiled on the basis of expedition research;
- Map of seismic zoning of the territory of Kyrgyzstan;
- Map of categories of protection forests, types of forests, forest renewal, deforestation CU;
- Vulnerability, seismic and hazard maps;
- Landslide maps;
- Open Free + Map, Hike-Bike, Bing Maps;
- A series of maps in the form of atlases were developed, published and implemented in the Ministry of Emergency Situations of the Kyrgyz Republic, local authorities;
- Early warning system of the population from strong earthquakes (CAIAG&GFZ) and transferred to the Ministry of emergency situations of the Kyrgyz Republic;
- A map of seismic micro - zoning of areas of densely populated cities - Bishkek, Karakol, Naryn has created and submitted for use to interested organizations;
- The map, compiled within the project, Pamir-Alay-Monitoring (PALM) is used for disaster risk management in cross-border areas between Kyrgyzstan and Tajikistan;
- Map of seismic zoning of the territory of Kyrgyzstan;
- Electronic maps and data taken from the Internet;
- Forests and Protected Areas Map;
- Thematic map of Osh city;
- Hazard map for Batken region.

4. What kind of maps do you have for environmental protection and management?

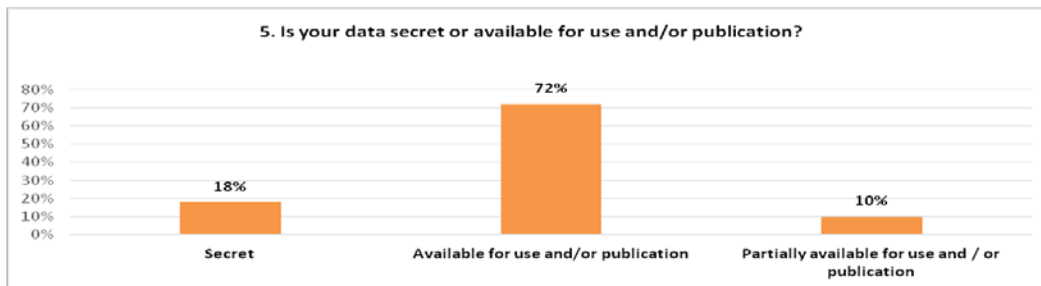
- Topographic, geological, climatic, soil and plant maps;
- Maps of glaciers;
- Space pictures, photos;
- Maps of landslides, seismic, geomorphologic maps;
- Forest map (forest protection, forest types, forest renewal, forest fires), maps of forests and protected areas of Kyrgyzstan;
- Map of soil erosion and salinity;
- In order to reduce disaster risks and their negative impact on the population and territory of CAIAG, IT uses all types of maps, models, classification scales (developed

in CAIAG), simultaneously real-time observations are continued on the basis of existing integrated systems and monitoring networks (earthquakes, landslides, glaciers, air temperature, precipitation, dust conditions).

- Topographic, geological, climatic, soil and plant maps
- Landslides, seismic maps
- Hydrological maps

5. Is your data secret or available for use and/or publication?

18%	Secret
72%	Available for use and/or publication
10%	Partially available for use and / or publication

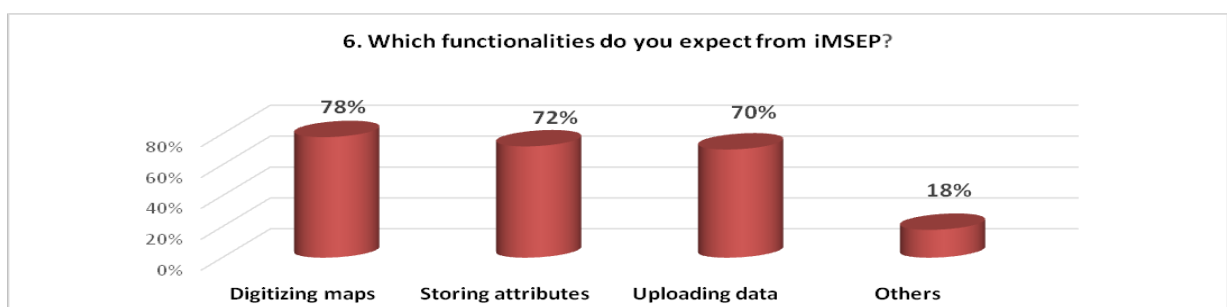


Comments:

- Topographic maps on a scale of 1: 25 000 are considered as secret maps (Department of forestry KR);
- Data on tailing dumps and mountain dumps maps are considered as secret maps (Ministry of emergency situations of the KR);
- Individual data (executed within the framework of projects / or on request) are partially available for publication.

6. Which functionalities do you expect from iMSEP?

78 %	Digitizing maps
72 %	Storing attributes
70 %	Uploading data
18%	Others: create a database (DB); management of database; basic spatial analysis (for making decisions); exchange of information; sharing the data.





Environmental Protection in Central Asia (EPCA):
Disaster Risk Management with spatial methods

Co-funded by the
Erasmus+ Programme
of the European Union



7. Do you have an Internet connection?

3 %	No
97%	Yes



Annex-1

QUESTIONNAIRE 1

1. How do you do environmental protection?

.....

.....

.....

.....

.....

.....

.....

.....

2. How do you do disaster risk reduction?

.....

.....

.....

.....

.....

.....

.....

.....

3. What kind of natural disasters do you work with? Please rank them according to the importance of your country (1-5, where 1 is most important)!

Rank	Mark	Types of natural disasters
		Landslide
		Flooding
		Pollution. Please specify.....
		Earthquake
		Avalanches
		Drought
		Desertification
		Other.....



4. What types of topics and practical works on environmental protection should be discussed?

Mark	Offered topics
	Erosion. Please specify.....
	Desertification
	Deforestation
	Mountain glaciers movement and monitoring
	Soil salinization
	Land cover monitoring
	Ecosystem monitoring
	Air pollution
	Water pollution
	Others.....

5. What kind of topics of disaster risk management related to GIS, RS and Spatial Data Infrastructure do you want to be taught?

Mark	Offered topics
	Remote sensing for soil degradation
	Remote sensing for monitoring the environment and land cover
	Spatial analysis for ecological threatened areas/hot spots
	Natural disaster risk analysis by spatial analysis
	GIS and RS for data acquisition and storage
	Spatial data infrastructure for data sharing
	GIS for spatial analysis
	Others.....

6. What are the indicators related to natural disasters? Which influencing factor(s) of natural disasters do you investigate?

.....

.....

.....

.....

.....

.....



7. Do you use GIS in your daily work?

	No
	Yes.

If yes, how do you use it?

.....

.....

.....

.....

.....

8. Do you use RS in your daily work?

	No
	Yes.

If yes, how do you use it?

.....

.....

.....

.....

.....

9. What GIS and Remote sensing software do you use?

.....

.....

.....

.....

10. General knowledge and skill of the workers at your organization on GIS and RS.

	Nothing
	Low
	Medium
	High
	Very high

11. Would you like to attend distance courses on GIS and RS?

	No
	Yes.



QUESTIONNAIRE 2

1. What kind of Spatial data do you use/or have?

.....
.....
.....
.....
.....

2. What kind of base maps do you have? (name, scale and information content).

.....
.....
.....
.....
.....

3. What kind of maps do you have for disaster risk management?

.....
.....
.....
.....
.....

4. What kind of maps do you have for environmental protection and management?

.....
.....
.....
.....
.....

5. Is your data secret or available for use and/or publication?

.....
.....
.....
.....
.....



6. Which functionalities do you expect from iMSEP?

	Digitizing maps
	Storing attributes
	Uploading data
	Others.....

7. Do you have an internet connection?

	No
	Yes

Annex-2

Short information about the associate partners and relevant organization involved in need analysis for disaster risk management and environmental protection in central Asia

#	Names of the involved organizations:	Internet /post address	Number of respondents
Uzbekistan			
1	Ministry of Emergency Situations of Uzbekistan	#4 house, Kichik halqa yo'li, Tashkent city, Uzbekistan. 100084.	4
2	Research Institute of Emergency Situations of Uzbekistan	#3 house, Anaybuloq Street, Kibray district, Tashkent oblast, Uzbekistan	5
3	Khorezm regional branch of Emergency Situations of Uzbekistan	# 12 house, Sherozi street, Urgench city, Khorezm, Uzbekistan. 220100	2
4	Bureau of Ecology and Environmental Protection of Uzbekistan	#2A house, To'ytepa Street, Yashnabod district, Tashkent city, Uzbekistan. 100159	7
5	Khorezm regional branch of Ecology and Environmental Protection organization of Uzbekistan	#1 house, Yoshlik street, Urgench city, Uzbekistan. 220100	2
6	Eco-Movement of Uzbekistan, Khorezm branch of Eco-Movement	#59 house, Mustaqillik Shoh Street, Tashkent city, Uzbekistan. 100000	2
7	Hydro-meteorological Scientific-Research Institution of Uzbekistan	#72 house, Bodomzor yo'li Street, Tashkent city, Uzbekistan. 100052	3
8	Hydro-meteorology organization of Karakalpak Republic	#3 house, Ashxabad street, Nukus city, Karakalpakstan. 230100	2
9	Karakalpakstan branch of Uzbek State Land Structuring Research Institute	9/1 house, Takhiatash guzari, Nukus city, Karakalpakstan. 230100	2
10	Land Resource and State Cadastre Bureau of Karakalpakstan	179a-house, Amir Temur street, Nukus city, Karakalpakstan. 230100	1
11	Ecology and Environmental Protection organization of Karakalpakstan	Berdakh guzari, Nukus city, karakalpakstan. 230100.	4
Kyrgyzstan			
1	Central-Asian Institute for Applied Geosciences (CAIAG)	http://www.caiag.kg/en/	9
2	The Agency on Hydrometeorology under Ministry of Emergency situations of the KR	http://www.meteo.kg/	5
3	Department of Water management and land reclamation of the Kyrgyz Republic	http://www.water.kg/index.php/ru/	2
4	The state Agency of Environmental Protection and forestry KR	http://www.ecology.gov.kg/	3
5	GIS-Centre (Department of cadastre and registration of rights to immovable property under State Registration Service of Kyrgyzstan)	http://www.gosreg.kg/#	2
6	Ministry of Emergency Situations of the Kyrgyz Republic - Crisis management center (Ministry of emergency situations of the Kyrgyz Republic);	http://mes.kg/en/	7

	- Emergency monitoring Department; - Monitoring and Forecasting Emergency Situations Department		
7	Ministry of Emergency Situations of the Kyrgyz Republic: Agency for the management of tailing dumps under the Ministry of emergency situations of the Kyrgyz Republic	http://mes.kg/ru/about/subordinate/agenstvo-po-obrasheniю-s-hvostochranilis/	2
8	The Institute for Seismology (National Academy of Sciences of the Kyrgyz Republic)	http://www.seismo.kg/en/	4
9	Institute of Water problems and Hydropower (National Academy of Sciences KR)	http://iwp.kg/	2
10	Institute of Geology (National Academy of Sciences of the Kyrgyz Republic)	http://www.naskr.kg/index.php/en/	2
11	American University of Central Asia	https://auca.kg/en/auca_at_a_glance/	2
12	Kyrgyz State University of Construction, Transportation and Architecture (KSUCTA)	http://ksucta.kg/en	5
13	Institute of mining and mining technologies	http://www.igd.kg/	3
14	Kyrgyz State Technical University named after Iskhak Razzakov	https://kstu.kg/en/	4
15	Bishkek Humanities University named after Hussein Karasayev (Faculty of Geography).	http://www.bhu.kg/	2
16	Kyrgyz National Agrarian University named after K.I. Skpyabin	http://knau.kg/en/home	5
17	Kyrgyz scientific Institute of irrigation	http://knau.kg/en/institutes/kyrgyz-research-irrigation-institute	1
18	Kyrgyz National University named after Zhusup Balasagyn	https://www.knu.kg/ru/	6
19	Kyrgyz Russian Slavic University named after Boris Yeltsin	https://www.krsu.edu.kg/index.php?lang=en	1
20	Kyrgyz State University named after Ishenaly Arabaev	http://arabaev.kg/en/	6
22	Osh State University, 'Physical geography and geodesy' department	http://www.oshsu.kg/?lg=3&id_parent=0	2
23	Osh Technological University	http://oshtu.kg/index.php/en/	3
24	Development of ecosystems and Protected Areas Department (Osh territorial administration)	http://www.ecology.gov.kg/	1
25	Osh basin water management Department	http://water.kg/index.php/en/subordinate-organizations/river-basin-irrigation-departments	2
26	Osh branch of Kyrgyz Engineering Researches	http://giiz.biz/en/	1
27	Central Asian Association of Water Users	http://rcf.kg/ru/partners-activity/partners/88-pf-caaw	1
28	Kyrgyz State Design Institute for Land Administration	http://www.agroprod.kg/index.php?pageID=105	2
29	Nookat Region Department of Urban Development and Architecture	http://gosstroy.gov.kg/ru/?p=167	1

Annex-3

List of GIS specialists who took part in the interviews

#	Name	Contact's	Institution
1	Alexander Zubovich	a.zubovich@caiag.kg +996 312 556600	Head of the Department 3 «Monitoring system and data management». Central-Asian Institute for Applied Geosciences (GAIAG)
2	Marat Jantaev	m.jantaev@caiag.kg +996(552)45763	Head of the information systems section (Department 3 «Monitoring system and data management») Central-Asian Institute for Applied Geosciences (GAIAG)
3	Olga Matushkina	matushkinaolga60@gmail.com +996(550)260660	Head of the laboratory of GIS and Databases (Kyrgyz scientific Institute of irrigation)
4	Almaz Abdiev	al.abdiev@gmail.com +996(555)996811	GIS- Centre (Department of cadaster and registration of rights to immovable property under State Registration Service of Kyrgyzstan)
5	Tynchtyk Kenzhetaev	Jgmp1305@mail.ru +996 (770)040431	GIS-specialist. Crisis management center (Ministry of emergency situations of the Kyrgyz Republic)
6	Bakytbek Polotov	b_polotov@mail.ru +996(770)077790	GIS-specialist. Crisis management center (Ministry of emergency situations of the Kyrgyz Republic)
7	Samat Bekzhanov	+996(770)932020	GIS-specialist. Crisis management center (Ministry of emergency situations of the Kyrgyz Republic)
8	Aman Akunov	+996(772)002600	GIS-specialist. Crisis management center (Ministry of emergency situations of the Kyrgyz Republic)
9	Ruslan Rashidinov	rashidinov@bk.ru +996(777)904114	GIS-specialist. Crisis management center (Ministry of emergency situations of the Kyrgyz Republic)
10	Bolot Sharshenov	depmon@mail.ru +996 (770)070878	Emergency monitoring Department (Ministry of emergency situations of the Kyrgyz Republic)
11	Kydyr Nazarkulov	Nazarkulov_k@list.ru +996(771)777787	GIS-specialist. Emergency monitoring Department (Ministry of emergency situations of the Kyrgyz Republic)
12	Bolot Sharshenaliev	s-bolot@mail.ru +996 (555)226218	Head of the educational and methodical part Of the center for training and retraining of specialists (Ministry of emergency situations of the Kyrgyz Republic)
13	Damirbek Kushbakov	aars_mes.kg@mail.ru +996(0312)562391	Agency for the management of tailing dumps under the Ministry of emergency situations of the Kyrgyz Republic
14	Altynai	Altynai7008@mail.ru +996(770)224443	Agency for the management of tailing dumps under the Ministry of emergency situations of the Kyrgyz Republic
15	Jeenbek Kulenbekov	kulenbekov_z@auca.kg +996(778)599278	Coordinator, Environmental Management and Sustainable Development Program Environmental Sustainability Officer Chair, Applied Geology Department American University of Central Asia (AUCA)
16	Nargiz Osmonova	Onargis86@mail.ru	Head of Information and analytical center

		+996(555)882848	Department of water management and land reclamation of the Kyrgyz Republic
17	Abakir Koilubaev	b.koilubaev@mail.ru +996(312)54 90 83	Deputy Director Department of water management and land reclamation of the Kyrgyz Republic
18	Gulsina Abdyrakhmanova	+996(500)871782	GIS-specialist. Department of water management and land reclamation of the Kyrgyz Republic
20	Dinara Beishenkulova	Dinara7070@mail.ru +996(771)245825	Teacher. Institute of mining and mining technologies
21	Toichubek uulu Joldoshbek	Joldoshbek.t@mail.ru	Junior researcher of the laboratory of Information security. Institute of Water problems and Hydropower (National Academy of Sciences KR)
22	Bakyt Jakeev	Baha75@list.ru +996(555)081889	Head of the laboratory of Information support. Institute of Water problems and Hydropower (National Academy of Sciences KR)
23	Akylbek Chymyrov	akylbek.chymyrov@aca-giscience.org +996 (312) 545602	Austria-Central Asia Centre for GIScience (ACA*GIScience) Head of Department "Geodesy and Geoinformatics" Kyrgyz State University of Construction, Transportation and Architecture (KSUCTA)
24	Atyr Jumabaeva	+996(312) 523826	Senior researcher. The Institute for Seismology (National Academy of Sciences of the Kyrgyz Republic)
25	Eldiyar Duulatov	+996(702)642342	GIS-specialist. Institute of Geology (National Academy of Sciences of the Kyrgyz Republic)
26	Askat Mukabayev	+996(702)919991	GIS-specialist. Bishkek Humanitarian University (Faculty of Geography)
27	Narynbek uulu Kurmanbek	+996(771)770218	GIS-specialist. Kyrgyz National University named after Zhusup Balasagyn (Faculty of Geography)
28	S. Belekov	+996(312)314835	The Agency on Hydrometeorology under Ministry of Emergency situations of the KR
29	D. Orozbekov	+996(312)314835	The Agency on Hydrometeorology under Ministry of Emergency situations of the KR
30	Imarali Nurdinov	Raibi888@gmail.com +996 771003888	Nookat Region Department of Urban Development and Architecture
31	Beksultan Murzali uulu	bekgpi@gmail.com +996 770392472	Kyrgyz State Design Institute for Land Administration
32	Jumashbek Toktosunov	giprozem_osh@mail.ru +996 552446645	Kyrgyz State Design Institute for Land Administration
33	Tynar Musabaev	caawosh@hotmail.com +996 777 800 339	Central Asian Association of Water Users
34	Turdubek Ajibaev	+996 772 518 194	Head of Monitoring and Forecasting Emergency Situations Department (Ministry of Emergency Situations of the Kyrgyz Republic)
35	Zhazgul Tutasheva	+996 770 221 255	GIS specialist of Monitoring and Forecasting

			Emergency Situations Department (Ministry of Emergency Situations of the Kyrgyz Republic)
36	Muradil Murzaliev	oshgiiz@rambler.ru +996 772 649596	Osh branch of Kyrgyz Engineering Researches Head Institute
37	Raeva Aiturgan	+996 777 250738	Osh basin water management Department
39	Raimzhanova Gulperi	gulperi_92@inbox.ru +996 776 037427	Osh basin water management Department
40	Kambarali Absatarov	+996 773 255575	Development of ecosystems and Protected Areas Department (Osh territorial administration)
41	Zirek Malicova	zirek.malicova@mail.ru +996 771 754888	Osh technological university, 'Cartography and geoinformatics' department
42	Kichaim Sydykbaeva	skichaim@mail.ru +996 555 310871	Osh technological university, 'Protection in emergency situations' department
43	Dinara Abzhaparova	+996 777859505	Osh state university, 'Physical geography and geodesy' department
44	Busalima Kadyrberdieva	kbusalima@gmail.com +996 7778 799704	Science Department, Osh technological university