Study of environment protection and Disaster Risk Reduction (DRR) and mitigation in Kulo municipality

(Draft Report)

European Neighborhood Programme for Agriculture and Rural Development in Georgia (ENPARD II)

Pilot Rural Development measures (phase II)

May 2, 2018

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Executive summary

The Kulo municipality is located in Ajara along Ajaristskali river and its two main tributaries (Khikhanistskali and Gorjomula). Its territory is characterized with unique physical-geographic conditions including sharp slopes and deep river canyons. Slopes are mostly covered by forest. Elevation from the sea level varies from 400 m to 3007 m. Due to such altitude differences and diverse landscape in such relatively small territory (710 km2), there are frequent natural events like landslides, mudflows, avalanches, flash floods, which additionally are intensified by climate change and anthropogenic factor.

Annual precipitation in this region is about 1 300 mm. The high level of precipitation causes abundance of water resources. Now there is a project (Ajaristskali hydropower) for using these resources for generating electricity. Khulo municipality is rich with forest, which covers about 52%[1] of its territory. The composition of forests varies and includes up to 400 sorts of bushes and trees, from which the most widely distributed are: Beech, chestnut, spruce, and fir. During the past decades different harmful diseases distributed in the forests. As a result, about 6%[2] of forests are infected by harmful diseases. Very alarming is the increase in distribution of those diseases in such valuable sorts as are chestnut and boxwood.

From 11 soil types registered in this region the most wide-spread are the following: grey (mountainous) and the mountain – meadow cord (alpine zone) soils. Last decades due to increase of heavy precipitation and utilization of agriculture lands, significant increase in water erosion of soil is noticed, which covers 30-35% of arable lands.

Agricultural lands occupy less than 25% of whole territory of the municipality, from where the biggest part is situated on the slope of more than 10% of inclination. The situation is particularly alarming in sub-alpine zone, where due to active use of land by animals, lawn cover of the land was destroyed in many places. That is accompanied by the soil degradation, which is also contributed by cutting down forests.

Diverse ecosystems and development of economic sectors in the municipality are under threat of natural disasters, which were significantly increased in frequency and severity due to global warming. Natural disasters tend to be repeated every year which increase damages and loses in household, agricultural and economic sectors.

[1] Young Scientists Union "Intellecti", 2012, Strategic Plan for Social-Economic Development of Khulo Municipality 2012 – 2022, Khulo, 39-40, (Geo).

[2] Environment Protection Directorate of Ajara Autonomic Republic, 2018.

1. Methodology

For conducting survey on environment protection and disaster risk reduction (DRR) and mitigation in Kulo municipality necessary information was collected from following institutions: National Environmental Agency (Ministry of Environment Protection and Agriculture), Environment Protection Directorate of Ajara Autonomic Republic, Ministry of Environment Protection and Agriculture, Infrastructure Division of Khulo Municipality.

In parallel guide was prepared (Annex 3) to conduct Key In deth Interviews (KII) with local population and self-government representatives of Khulo Municipality. Totally 26 interviews conducted with local people and municipality staff. In addition different reports were reviewed related to disaster risk reduction in Khulo municipality. Detailed list of documents are provided in Annex 4.

Field research (11 – 14 April, 2018) was conducted in Khulo municipality. Local people, as well municipality staff were interviewed based on prepared guide. Two types of guide were used. One, intended for local authority's staff and another for local people.

2. Key findings

2.1. Extreme natural events

Khulo municipality is located along Ajaristskali river (upstream). Due to its diverse landscape, which encompasses mountains and sharp slopes, Municipality of Khulo is vulnerable to extreme natural events such as flash floods, landslides, avalanches, mudflows and erosion.

Most villages are located on medium and sharp slopes along rivers Ajaristskali, Khikhanistskali and Gorjomula. Agricultural plots are located as well in these river basins and most pastures in alpine and sub-alpine zones.

As it was mentioned, the municipality is reach with forest, which is about 52 % of its territory. People regularly use forest mainly as a fire wood, construction material and as well for collecting different wild fruits, mushrooms and berries. Because in most cases cutting trees are uncontrolled and touches very vulnerable slopes (vulnerable slopes here mean whether landslide take place it will directly affect houses, agricultural plots, roads or other infrastructure.) intensive landslide processes can be developed. Of course landslides and other natural events usually happen naturally, but anthropogenic factor (uncontrolled logging, infrastructural works) intensifies here these processes. Another anthropogenic intervention, which increases risk of extreme natural events, is constructing roads and other infrastructural buildings on slopes with high inclination. All such construction should be based on strong geo-engineering conclusions.

Based on forecasts, precipitation in this region and particularly in Khulo municipality has been increasing. Some data are presented in Table 1.

Table 1. Deviation of total precipitation in Ajara from average norm of 1961-1990 in September 2009[3]

Weather station	Kobuleti	Keda	Khulo
Total precipitations for month (mm)	563.8	227.6	207.0
Deviation from norm (%)	207.0	160.0	219.0

As it is shown on the Table 1, total precipitation between periods 1996-1990 and 2009 has been increased by 219% for Khulo municipality. It means that more extreme natural events will happen in future. Therefore DRR as well emergency response should be reflected in all development strategies and action plans of the municipality.

In the conditions of projected climate change, the reduction of avalanche risk hasn't turned out to be expected in Ajara mountainous region by 2050. At the same time, considering the forecasted significant increase of days with abundant precipitation (> 90 mm) up to 2050, further activation of landslides and mudflows is supposed in Ajara mountainous region including Khulo municipality4.

2.2. Disaster Risks by Communities

According to the latest census (2016) the number of Khulo Municipality population is 23.4 thousand. Population density is 47.1 mp / km2, which is lower than the country's average indicator (67 mp / km2). 96.5% of the population lives in rural areas, 3.5% is concentrated in Daba Khulo. Majority of the population is settled in the river valley and foothills, the resettlement area is extended within 1000-1400 m above sea level. The municipality is bordering from South Turkey, East – Adigeni municipality, North – Chokhatauri municipality and West – Shuakhevi municipality.

Khulo municipality consists of 13 communities. Different reports (Geological Report for 2018 – National Environmental Agency. Geological reports from Environment Protection Directorate of Ajara Autonomic Republic. Georgia's Third National Communication to the UNFCC) prove that it is high risk area suffering from extreme natural events. These risks are growing for last decades due to climate change as it is mentioned as well in national communications of Georgia to the framework convention on climate change. Since 1980th Due to natural disasters many families resettled from Khulo municipality to other municipalities and towns of Georgia (Tsalka, Kobuleti, Poti, Marneuli). Only for this year (2018) local authority of Khulo municipality

[3] Ministry of Environment and Natural Resources Protection of Georgia, 2015, Georgia's Third National Communication to the UNFCC, Tbilisi, 145, (Eng).

[4] Ministry of Environment and Natural Resources Protection of Georgia, 2015, Georgia's Third National Communication to the UNFCC, Tbilisi, 17, (Eng).

prepared 120 applications for family resettlement/financial compensation due to natural disasters.

Based on analysis of reports from National Environmental Agency as well Environment Protection Directorate of Ajara, natural disasters vary between communities of Khulo municipality. But almost in all communities dominate landslides. Below is presented major natural threats by communities of Kulo municipality.

Gorjomi

Upper site to Chakhauri village of Gorjomi community, on mountain slope, there is a big landslide with deep crack. This landslide threatens the village, therefore local people regularly monitor visually the width of the crack. First of all observation points or inclinometer should be installed here for comprehensive landslide monitoring. Using this method of monitoring, local authority and people will be timely notified about possible threat. In Gorgadzeebi village there is landslide which affects connecting road and three houses. There is also flashflood in Gorjomi and labadzeebi villages. In Tsintskalashvilebi village landslide affects four houses and Didajara – Gorjomi road. Same is in Mekeidzeebi village where landslide affects a village road.

Agara

In Agara, due to sharp slopes and havy snow, there are frequent cases of avalanches with dramatic consequences. In winter 1979 two houses were totally destroyed. There is also landslide near national road Agara – Khulo. When landslide moves it destroys road and driving on this part of road sometimes is impossible. In Analeki district there is rockfall which is very dangerous for walkers and cars. Another landslide is developed upper side of village, where 20 houses are under threat. In 1990th public school was destroyed by this landslide.

Skhalta

In Skhalta municipality villages Kinchauri, Kvatia and Pachkha are under threat coming from landslides, avalanches and mudflow. Avalanche, which came down in Avaznis-Gele, destroyed one house in Kinchauri. This family was resettled by the government. In Tsablana 23 people were killed by landslide in 1989. Landslide also affects connecting road and houses in these village. Kinchauri suffers also from mudflow, which happens in late spring and/or summer in "Sakavrias gele" canion.

Pushrukauli

Community Pushukauli is located in Khikhanistskali river basin, which is left tributary of river Ajaristskali. Here four high risk landslides are active. Two of them are upper site of public school and houses in Pushukauli village. Two other high risk landslides are in Makhalakuri village. Here 15 houses and agricultural territories are under threat. In Oshanakhevi village there is avalanches in winter time. It damages the village road and two houses. In Makhalakuri there is flahslood as well, on Samsmelistskali river. It affects Surmanidzeebi district and public school.

Riketi

In Riketi community which is located along Ajaristskali river and several small its tributaries, suffers from landslides and avalanches. Totally five high risk landslides are located here. One, near Danisparauli village, which affects bridge and national road (Khulo - Adigeni) and second affects six houses. Other two landslides are located in Bodzauri village and as well affect village road and houses. There is also landslide in Didi Riketi village which affects 9 houses.

Dioknisi

Dioknisi community is located in Ajaristskali basin (upper Khulo). Landslides, avalanches, erosion processes and flashfloods dominate here. Dioknisi village is affected by flashflood coming from mountain stream, which cross the village. Mostly flashflood happens in spring and summer due to snow melting and heavy rain. As a precautionary measure for decreasing risk from flashflood installation of community based early warning system could be helpful for Dioknisi. Such system can be used in settlements which suffer from flashfloods.

In Dioknisi there are 4 high priority landslides. Two landslides affect connecting road and agricultural plots in Jvariketi. One landslide in Chiritskaro and one in Nakokhvara affect houses and agricultural plots. There are also erosion processes, two – located in Gorjomeladzeebi village and two in Gurta, which affect village roads and agricultural land.

Mudflow also happens in Maniaketi, Tabakhmela and Jvariketi villages.

Didajara

In Didajara community suffers from landslides, avalanches and rockfall. Avalanches and rockfall affect Iremadzeebi village especially. In Bugauri there are two landslides which affect connecting road. In didajara village landslide threatens five houses and Khulo - Gorjomi road.

Vashlovani

Difficult situation is in Vashlovani community, particularly in Vashlovani village. Quite big landslide moved down and destroyed houses in 2016. Five families have been resettled to newly constructed building (so called social building) in Vashlovani. Other 3 families received financial compensation from government for purchasing houses with agricultural plots. Due to avalanche in Skhandara village 3 houses were resettled to Vashlovani social building. High risk landslides are in Zemovashlovani. In Skhandara village avalanche affects two houses. There is also mudflow, which damages agricultural lands.

Dekanashvilebi

Totally six high risk landslides are in Dekanashvilebi community. Two of them are in Uchkho which affect Roads and four houses. In this village there is avalanche ad flashflood. They affect agricultural lands and 6 houses. There is also high risk landslide in Dzirkvadzeebi village, which threatens public school. One landslide is also in Zeda Dekanashvilebi and one in Qedlebi village and one in Elelidzeebi. All these landslides affect roads and houses.

Satsikhuri

Satsikhuri community is affected by land erosion, landslide and flashflood. In spring and summer time there is flashflood in Satsikhuri village, which damage road, and gardens. In affected places there is land erosion. Road and several houses are damaged cause of landslide in Gelaura village.

Khikhadziri

Major threats in Khikhadziri community are landslides and avalanche. During last couple years six houses significantly damaged by avalanche in Khikhadziri. On Skhaltistskali river there is regularly flashflood affecting 12 – 15houses. In Skvana village there is one high risk landslide and five houses are under threat. As well one landslide is in Khikhadziri village.

Tkhilvana

T Tkhilvana community is affected by landslides and avalanches. Due to landslide in Qveda Tkhilvana village which happened 2017, government decided to resettle all houses. Totally there are 96 houses. Now 67 families received financial compensation, from the government, for resettlement. Other 29 families are waiting this compensation. There are avalanche and landslide in Bako village. In 2007 this landslide activated and in 2016 landslide damaged several houses. Five families received financial compensation for resettlement.

Totally about 400 landslides are registered in Khulo municipality and they are ranked as high, medium and less priority. Below, in Table 2 are presented major extreme natural events which are high and medium priority and need to minimize risks in short and mid periods.

Table 2. High risk extreme natural events by community

Community	Number of Landslides	Number of Avalanches	Number of Flashlood	Number of Mudflow	Number of Rockfall	Number of Erosion
Gorjomi	2		2			
Agara	2	1			1	
Skhalta	2	1		1		
Pushrukauli	4	1	1			
Riketi	4					
Dioknisi	4		1	3		4
Didajara	3	1			1	
Vashlovani	3	1		1		
Dekanashvilebi	5	1	1			
Satsikhuri	1		1			1
Khikhadziri	2	1	1			

Tkhilvana	2	1				

2.3. Solid Waste Management

Solid waste is one of the main problem for Georgia and as well for Khulo municipality. Khulo municipality has not its own official landfill which could meet minimum standards. Municipal waste is considered by local people as a garbage, which should be throw out from household space. Consequently solid waste can be found everywhere, along roads, near different infrastructure, close to rivers and streams. Finally, contamination from all such landfills flows to the streams and then into Ajaristskali river. Therefore such type of places with waste can be considered as a sources of water pollution. Almost in every village exist one or more places where people leave their waste. Here different kind of waste can be found (municipal, waste from construction, agricultural waste and so on). Usually such "landfills" are located either close to roads, in the beginning or end of villages, or near streams/rivers. For example, in Dioknisi village there are three illegal landfills, from which two are located near to streams and one – close to village road. In Gorjomi there are four landfills located near to roads and river.

Since 2010 Khulo municipality purchased 164 waste containers and two off road tracks for transportation of waste. Additionally, in Beshumi resort there are 70 containers placed. Now from 84 settlements 52 are equipped by waste containers. Tracks transport waste to the place where waste is loaded in other waste tracks and because in Khulo municipality there is no official landfill, waste is transported to Batumi landfill. Waste collection and transportation in Khulo municipality is operated by company "Kulos municipal service" LEPL, which is established by the Khulo's municipality. In 32 villages there are no waste containers. Municipality of Khulo plans till 2022 cover all villages by waste containers, so 150 containers will be purchased in next three years. Waste tracks take waste from containers usually once a week. It is obvious that two cars are not enough for waste transportation, moreover transportation problem will increase when all villages will be covered by containers.

For the time being there is no fee for local people on municipal waste, but in future probably taxes on municipal waste will be introduced because waste management is costly and government donation of this sector will not be justified in future.

In winter, there is a problem with transportation of waste from containers to discharging point. Many roads connecting to villages are closed due to big snow. Sometimes waste from containers is taken after several weeks or month. In this situation one way is to regularly clean roads from snow and buy special small waste cars.

3. Conclusion

Due to landscape diversity and complex geo morphological structure, frequency and intensity of disasters, Ajara is one of the distinguished regions of Georgia. Prolonged abundant rainfalls, including heavy snow precondition floods/flashfloods, landslide and mudflow processes, snow avalanches as well as high recurrence of disasters is characterized for this municipality. During last decades activation of mentioned processes became obvious. The reason for this is climate change with its negative manifestations (frequent rainfalls), increase of tectonic activity and increase of anthropogenic load on natural environment. According to landslide and mudflow hazard, Ajara was attributed to medium and significant risk category (with coefficient of 0.3 – 0.5) by 70s of the past century, by 2000 this region has moved to the high and very high risk category (with risk coefficient of 0.5- 0.9)[5].

Therefore more efforts need to minimize risks coming from the natural disasters. Based on already revealed natural disasters specific measures need to be designed and implemented.

For upgrading waste management in Khulo municipality additional containers and cars for transportation have to be purchased.

Compost production should be introduce on household level, which will make its input in mitigation of climate change, as well in minimizing waste.

[5] Ministry of Environment and Natural Resources Protection of Georgia, 2015, Georgia's Third National Communication to the UNFCC, Tbilisi, 16, (Eng).

4. Recommendations

Object of Intervention	Intervention	Responsible Agency	Result of Intervention	Recommendation Period
Regulation under Forest Code of Georgia	Strengthen implementation of regulation related to special protective status for forest on slopes with high inclination located upper side of a settlement.	Ministry of Environment Protection and Agriculture, Environment Protection Directorate of Ajara, Khulo municipality.	Decrease landslide and land erosion risks which affect settlements	Short-term
Awareness raising for local people in Khulo municipality on illegal logging on slopes	Trainings, consultation meetings with target local people. Dissemination of leaflets.	NGO	Increase awareness of local people on adverse effect of cutting trees on sharp slopes	Medium term
Irrigation of agricultural plots in Khulo municipality	Introducing drip irrigation systems	Government of Ajara, International projects	Decrease landslide risks on agricultural lands.	Medium term
Pushukauli, Dioknisi, Dekanashvilebi, Satsikhuri and Khikhadziri	Installation of community based early warning systems	Government of Ajara, government of Georgia, international projects	Ensures timely notification of local people about flashflood.	Medium term
Chakhauri village, Gorjomi community	Installation online inclinometer on landslide	Geological Department, National Environmental Agency	Ensures timely notification of local people about landslide activation	Short-term
All communities of Khulo municipality	Installation of solar systems on administrative buildings and houses	Government of Ajara, government of Georgia, international projects	Will decrease consumption of firewood as well traditional electricity. Climate change mitigation.	Medium - long term
All small and medium farmers in Khulo municipality	Trainings, Awareness raising for production of compost	NGOs, international projects	Decreases amount of municipal waste, Decreases carbon dioxide emission	Medium term
Municipal Waste Management Service, Khulo	Purchasing three waste transportation cars	Government of Ajara, government of Georgia, international projects	Ensures timely discharge full containers from waste and its transportation to Batumi landfill.	Short term
Municipal Waste Management Service, Khulo	Construction waste re-loading facility near road Khulo - Batumi	Government of Ajara, government of Georgia, international projects	Ensures flexibility in re-loading waste from one car to another	Medium term
Municipal Waste Management Service, Khulo	Purchasing two waste transportation cars, which will serve Beshumi resort	Government of Ajara, government of Georgia, international projects	Ensures timely discharge full containers from waste and its transportation to Batumi landfill.	Medium term
Awareness raising for local people in Khulo	Trainings, consultation meetings with target local people. Dissemination of	NGO	Increase awareness of local people on real problems from waste.	Medium term

municipality on municipal waste	leaflets.		Introduces new attitude regarding waste	
Strengthen skills in emergency response of local people of Khulo municipality	Trainings in emergency response	Emergency Management Agency	People will gain knowledge and skills what they should do in emergency situations.	Medium term

Extreme Natural Events and Possible Measures for Minimizing Risks

Extreme Natural Event	Location	Measures for decreasing risk and/or stabilization
Landslides	Chakhauri village Gorgadzeebi village national road Agara-Khulo Analeki village Tsablana Pushukauli Makhalakuri Danisparauli Bodzauri Didi Riketi Jvarikedi Chiritskaro Nakokhvana Bbugauri Didajara Vashlovani Zemo Vashlovani Uchkho Dzirkvadzeebi Zeda Dekanashvilebi Qedlebi Elelidzeebi Gelaura Skvana Khikhadziri Qveda Tkhilvana Bako	Detailed Geological study is needed for any particular landslide. General measures for stabilization of landslides are as follow: -Avoid water from landslides by constructing drainage systems; - Construction gabions and other protective walls where appropriate; - Installation observation points or inclinometers for monitoring landslide's activity; - Planting trees with deep roots; - Slope terracing.
Avalanches	Agara Kinchauri Avazisgele Oshanakhevi Iremadzeebi Skhandara Dekanashvilebi Khikhani Bako	Installation warning systems such as Doppler or vireo control, which allow timely notify local people.
Flashflood	Gorjomi Labadzeebi Makhalakuri Dioknisi Uchkho Satsikhuri Khikhani Skhaltistskali	Installation of community based early warning system. Such system is installed on Devdoraki.
Mudflow	Kinchauri Maniaketi Tabakhmela Jvarikedi	Installation warning systems such as Doppler or vireo control, which allow timely notify local people.

Extreme Natural Event	Location	Measures for decreasing risk and/or stabilization
	Sandara	
Rockfall	Analeki Didajara	Installation warning systems such as Doppler or vireo control.
Erosion	Gorjomeladzeebi Gurta Satsikhuri	The reasons of erosion should be investigated and then measures defined.

Annexes

Annex 1. List of respondents

Name	**Community**
Temur Iremadze	Gorjomi
Nugzar Tsintskaladze	Gorjomi
Temur Beridze	Gorjomi
Bezhan Mikeladze	Agara
Izolda Surmanidze	Skhalta
Raul Makharadze	Skhalta
Omar Abashidze	Pushukauli
Nugzar Shamanadze	Riketi
Gocha Shantadze	Riketi
Ruslan Geladze	Dioknisi
Vazha Dzirkvadze	Dioknisi
Guram Kakhadze	Dioknisi
Guram Dzirkvadze	Dioknisi
Badri Meladze	Didajara
Irma Shavadze	Didajara
Lado Abuladze	Vashlovani
Tornike Kakatsidze	Vashlovani
Vazha Tavartkiladze	Dekanashvilebi
Gogi Bolkvadze	Dekanashvilebi
Irakli Tavartkiladze	Dekanashvilebi
Roland Dekanadze	Dekanashvilebi
Leri Tavartkiladze	Khulo
Temur Mgeladze	Satsikhuri
Bezhan Bolkvadze	Satsikhuri
Guram Khalvashi	Khikhadziri
Mamuka Kamashidze	Tkhilvana

Annex 2. Number of waste containers by community

Community	Number of waste containers
Gorjomi	11
Agara	6
Skhalta	9
Pushrukauli	6
Riketi	8
Dioknisi	18
Didajara	9
Vashlovani	20
Dekanashvilebi	30
Khulo	23
Satsikhuri	7
Khikhadziri	8
Tkhilvana	9

Annex 3. Guide

Environment Protection, Disaster Risk Reduction (DRR) and Mitigation in Kulo Municipality

Questionnaire

1. Below presented which natural disasters are more distinctive for Kulo municipality?

Flood	
Flashflood	
Heavy Rain	
Avalanche	
Landslide	
Mudflow	
Desert	
Other, Please specify	

2. Please list those extreme natural events, which happened in last five years

3. Based on your experience what obstacles you face when fighting with extreme natural events?

4. Do you have emergency management plan in your municipality?

Yes ☐ No ☐ It is under preparation ☐ Do not know ☐

5. Was there any training regarding emergency response (or other trainings related to this subject)?

6. In emergency situations how warning notification is disseminated?

7. Please share your opinion what should be done in future for minimizing damage from extreme natural events.

8. How many landfills exist in your community?

9. Where are mostly located landfills (near road, river, stream, in forest, field)?

10. Is there municipal waste management service in your community/municipality?
    Yes ☐ No ☐

11. If yes, which organization is responsible for it and how often they transport waste?

12. If there is official landfill please describe it.

13. Were there any trainings conducted in your municipality regarding municipal waste management?
    Yes ☐ No ☐ Do not know ☐

    If yes please share your opinion.

14. Please present your recommendations for improving waste management in your municipality.

Annex 4. List of Documents Reviewed

- Environment Protection Directorate of Ajara Autonomic Republic, 2017, Geological Report, Batumi, (Geo);
- European Network for Rural Development, 2016, LEADER Local Development Strategies (LDS), Guidance on design and implementation (Eng);
- Kazbegi Development Group (LAG Kazbegi), 2016, Development Strategy for Kazbegi Municipality 2016 – 2020, Kazbegi (Geo);
- Ministry of Environment and Natural Resources Protection of Georgia, 2015, Georgia's Third National Communication to the UNFCC, Tbilisi, (Eng);
- National Environmental Agency, 2018, Results of Geological Processes in Georgia in 2017and their forecast, Tbilisi, (Geo);
- Young Scientists Union "Intellecti", 2012, Strategic Plan for Social-Economic Development of Khulo Municipality 2012 – 2022, Khulo, (Geo).