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Mudflow Hazards in the Georgian Caucasus - Using Participatory Methods to Investigate Disaster Risk

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Introduction

The Caucasus forms an extremely complex mountainous area of Georgia in terms of geology and the scale and frequency of natural disaster processes. These processes, especially mudflows, frequently result in considerable damage to the settlements, farmlands and infrastructure facilities. The occurrence intervals between mudflows are becoming significantly shorter, therefore the most populated areas and infrastructure need to be included in risk zones.

This presentation reviews the case of the mudflow problem in Mleta village in the region of Dusheti where the mudflow risk is critical. The villages of Zemo Mleta (Higher Mleta) and Kvemo Mleta (Lower Mleta) are entirely surrounded by unstable slopes where mudslides, landslides and floods are often generated. These hazards occur at least once per year and sometimes result in severe events. In 2006 and 2010 in Mleta village a very severe mudflow event occurred creating heavy damage. This paper focuses on the recognition of the importance of cooperating with the local communities affected by these disasters, in order to get useful information and local knowledge to apply to disaster prevention and management.

In October 2010, the EU- financed MATRA Project (Institutional Capacity Building in Natural Disaster Risk Reduction) in Georgia included fieldworks in several locations. Particular attention was given to Mleta village in the Caucasus Mountains, where the activities focused on institutional capacity – building in in disaster risk reduction, including modern spatial planning approaches and technologies and the development of risk communication strategies.

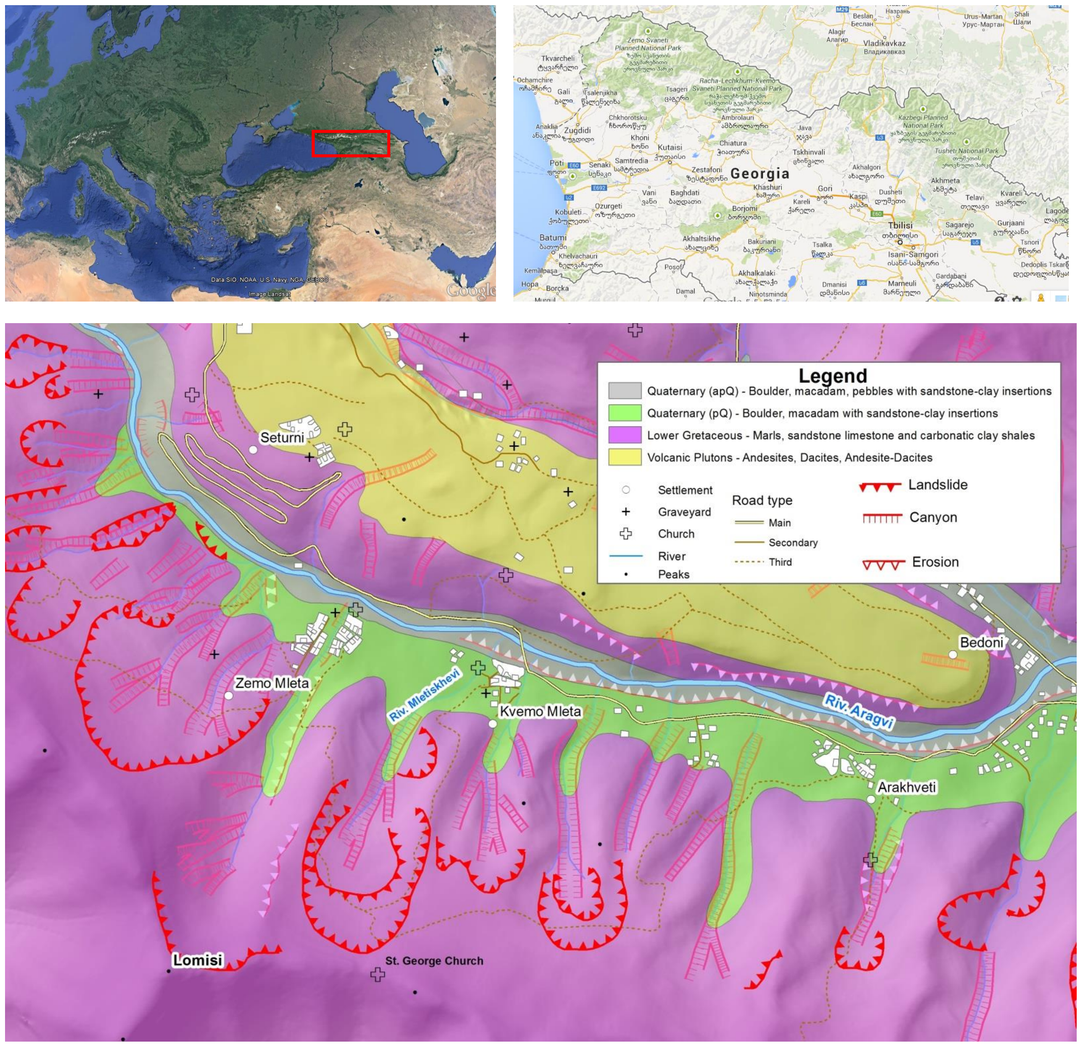

Fig. 1. Mleta, Georgia

Fig. 2-3. Two perspective of of the thick layer that destroyed and partially covered the village of Mleta in 2010. In the front line the church of St. George is recognizable.

Methodology

Participatory methods of acquiring local knowledge from local communities have been tested in order to evaluate the advantages and disadvantages of compared to traditional survey approaches for collecting data. In a participatory survey and planning approach, local authorities, experts and local communities are supposed to work together to provide useful information and eventually produce a plan for Disaster Risk Reduction/ Management (DRR and DRM). In order to assess the local vulonerability to disaster risk it is necessary to communicate with the locals in order to collect information that otherwise would be lost. Participatory surveys (and participatory monitoring) elicit local people's knowledge about the specifics of the hazard concerning frequency, timing, warning signals, rates of flow, spatial extent, etc. The participatory methods employed in Mleta included historical discussions with key informants, village societal transects, participatory mapping with children, semi- structured interviews with inhabitants, and VCA (Vulnerability & Capacity Analysis). The program CybetTracker (CT) was used during the fieldwork for the collection of information regarding the mud flow event of 2010.

Fig. 4-5. Same view of the village of Mleta: the group of houses clearly visible in June 2009 (spring/ beginning of the summer) has been almost entirely covered by debris and partially destroyed in September 2010 (beginning of autumn).

CT allows the communication with the people even if the mother tongue is different thanks to special officially recognized icons, maps and graphs allowing th einvestigator to ask for information, and the local interlocutor to answer in a quite detailed way. The geomorphological map produced on the base of the local geology has been realized with ArcGIS. This allowed the assessment of the areas at risk and the relative maps. We adapted and tested the software CyberTracker as a survey tool, a digital device method of field data colleccyion. Google Earth, OpenStreetMap, Virtual Earth and Ilwis have been used for data processing.

Station N	Year	Month	Day	T mean	t max	t min	Rainfall
pasanauri	2010	4	1	8.7	17.5	2.9	0
pasanauri	2010	4	2	8.9	16.5	0.9	0
pasanauri	2010	4	3	5.8	14.5	2.9	8.2
pasanauri	2010	4	4	7.3	13.5	4	1.8
pasanauri	2010	4	5	6.2	15	0.9	2.2
Pasanauri	2010	4	6	7.4	12.6	3.1	0T
Pasanauri	2010	4	7	9.3	17.5	2.4	0
pasanauri	2010	4	8	9.3	16	6.3	6.9
pasanauri	2010	4	9	7.2	11.4	2.9	0
pasanauri	2010	4	10	6.4	9.5	3.3	0
pasanauri	2010	4	11	6.3	12.5	0	0
pasanauri	2010	4	12	3.6	9	1	24.2
pasanauri	2010	4	13	5.4	10.4	1.9	20
pasanauri	2010	4	14	6.6	12	1.8	0
pasanauri	2010	4	15	5.4	11	0.5	2.4
pasanauri	2010	4	16	10.3	19	4.7	1.7
pasanauri	2010	4	17	13.3	21.5	6.2	0
pasanauri	2010	4	18	12.5	19.5	5.9	0
pasanauri	2010	4	19	9.1	16	6.5	2.4
pasanauri	2010	4	20	9.4	15.5	5.7	10.2
pasanauri	2010	4	21	11.4	18.4	5.2	0
pasanauri	2010	4	22	13.6	19.4	7.9	1.2
pasanauri	2010	4	23	8.2	13	6.5	18.4
pasanauri	2010	4	24	7.4	10.5	5.9	23.5
pasanauri	2010	4	25	9	13.5	5.2	2.3
pasanauri	2010	4	26	10.1	14.4	6.7	1.2
pasanauri	2010	4	27	9.4	13	6.5	1.3
pasanauri	2010	4	28	8.6	12	6.7	2
pasanauri	2010	4	29	6	8.2	4.2	0
pasanauri	2010	4	30	8.9	15.4	3.8	0

Fig. 7. Details from the meteorological stations in April 2010: on 24th the water, mixed to debris, mud, gravels and occasionally large boulders, burst in the village of Mleta.

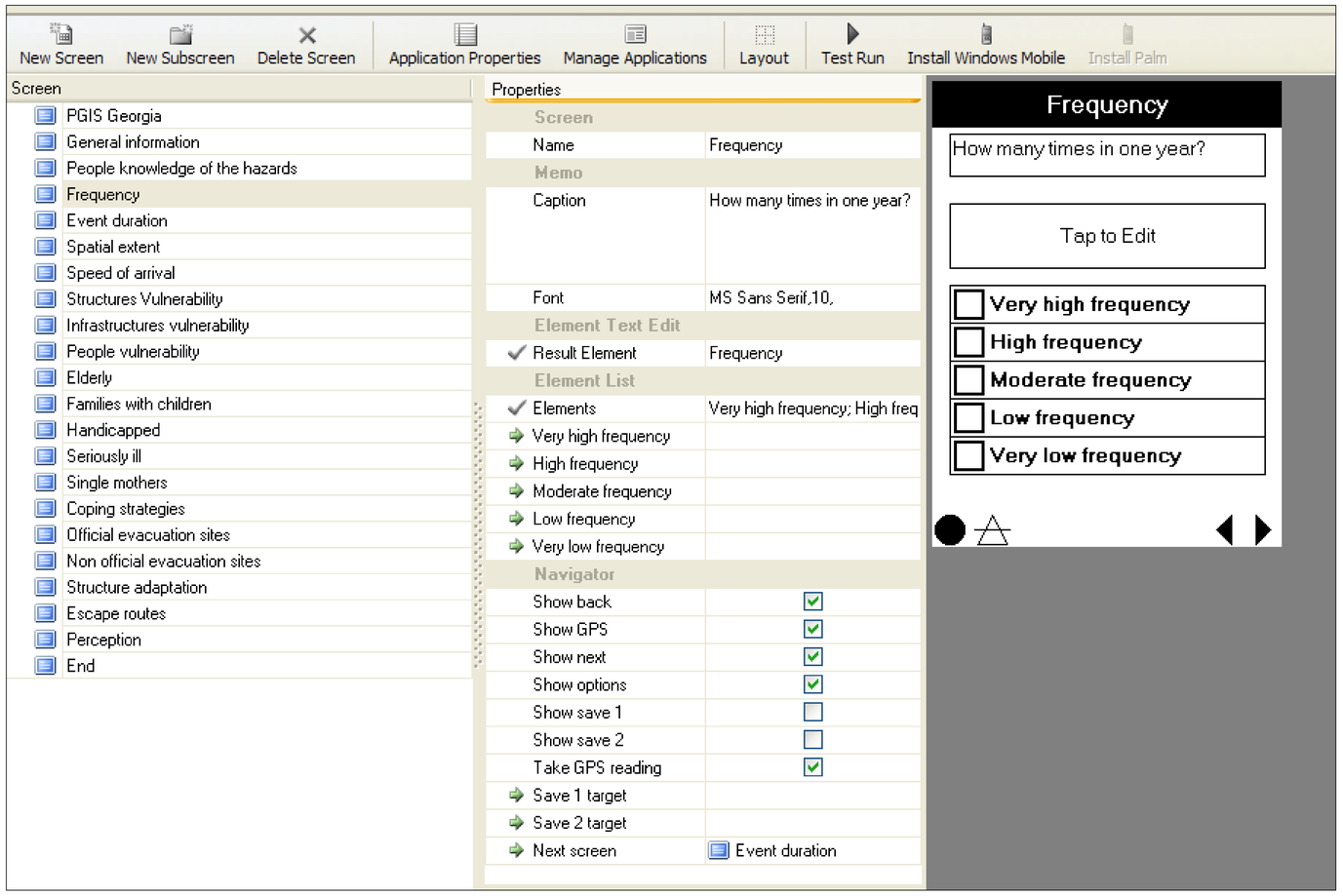

Fig. 6. Image of the sequence used during the information collection in Mleta.

Results and future perspectives

The participation of local communities in the monitoring of extreme events can be definitely useful for the work of the experts and the local governments in order to reduce the risk of disaster. Significantly, only this local knowledge from informants can reveal essential information about different vulnerabilities. Even before receiving any external help, they started to react and organize themselves to face following events, even if very basically.

The actors involved in the project, belonging to different governmental agencies and NGOs, considered very useful the participation, in the future, of local communities in the implementation of emergency plans and the design of environmental and spatial planning in order to organize more functional and safe rural areas. The tools used for information collection, visualization and interactive mapping are developing every day more and becoming more user friendly and stable. Planning in areas at risk of disaster appear certainly more efficient involving participatory methods which are complementary to the traditional ones, and this is the line that most the involved stakeholders are aiming to follow in the future.

Data analyses

Georgia is a country with around 5.000.000 people and 69.510 km² (Wikipedia, 2012). It lies in an extremely complex mountainous region, in terms of the scale and frequency of natural disaster processes and damage to people, farm lands and infrastructure. The Caucasus Mountains can reach and exceed 5.000 meters and they have mainly a volcanic origin and they are often alternated by plateaus that usually do not exceed 3.400 meters in elevation. Two major rivers are the Rioni and Mtkvari. The Southern Georgia Volcanic Highland is a young and unstable geologic region with high seismic activity, but in the region of Dusheti the geology is represented almost entirely by sedimentary rocks (from Lower Cretaceous to Quaternary) except for the volcanic plutons in the north of the region.
The mudflow hazards occur at least twice per year and sometimes they result in severe events. In 2006 and 2010 a very severe event occurred in the village of Mleta creating heavy damages.

Fig. 10. Representatives of the Georgian Red Cross, other NGOs and local government collecting the testimony of the inhabitants of Mleta.

Fig. 11. The Orthodox Monks were explaining the disaster from their point of view.

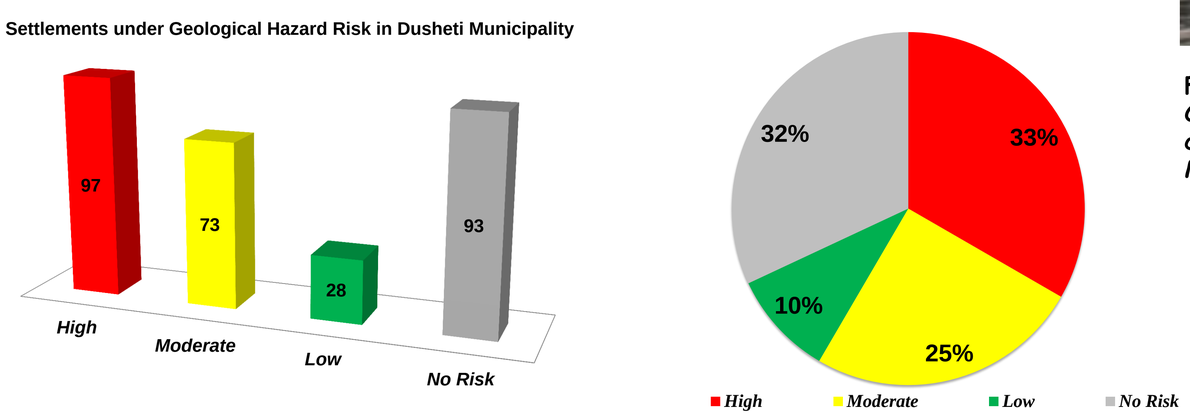

Fig. 8-9. The two graphs show the percentage of the settlements under geological hazard risk in the municipality of Dusheti and the classification, in percentage, of the entire territory: as it is possible to notice, only the 32% of the land has no risk of hazard. Distributed across the territory there are 97 settlements located in the area with high risk of geological hazard.