3.3 Recommended solutions for extreme events sector

Extreme geological events could happen in any place in a country and in the world but this doesn't mean that the hazard and high risk are typical features and are vital for the country or the region within the country. Having relatively young mountain the South Caucasus region is featured by high sensitivity to extreme events such as landslides and mudflows but there are sites particularly sensitive to these hazards. In previous political system even local problems have been solved by centralized approach but changes happened in Georgia show that most of problems should be and can be solved locally by local governments and communities. Raising awareness among the local decision makers to consider extreme geological events in the list of local priorities and organize community based approach for the implementation of protective measures against landslides and mudflows, whenever such approach is feasible, could be considered as the principle recommendation from the project. Local services, similar to agriculture service centers (described in agriculture section), should be organized by the central or local governments. In the regions with high vulnerability to landslides and mudflows, existing agriculture service centers could be extended and used for providing recommendation to the local governments and communities on preventive measures against extreme events as well. This approach doesn't mean that the central government has no responsibility in this process. The central government responsibility still should be large landslides creating threat for strategic objects of the country's infrastructure and setting up of enabling environment for the development and transfer of new technologies and services.

3.4 Technology action plan, project ideas, and other issues in Extreme events Sector Technology action plan

3.4.1 TAP for landslides protective (palliative) measures

Lack of capacity and awareness to involve local population in implementation process of preventive measures is the main barrier in using of this technology.

- Investigation of engineering-geological conditions of the pilot territories and selection of effective measures for each area under particular risks.
- Intensive consultations with population on possible risks and the ways to avoid them for the awareness raising purposes
- Opening of local Service Centers (regional and municipal) or using the existing ones (for the time being such centers are established by the governmental initiative for the purposes of servicing the Agricultural Sector). Supplying of such centers with a package of effective measures for risk minimization of the dangerous processes.
- Mobilization of village population/communities around the mentioned problem and ensuring of their maximum involvement into the monitoring of the dangerous processes and to the implementation of preventive measures.
- Landslide area of village Shurmuli. Regulation of surface waters through arrangement of drainage pipes and berms.
- Large landslide area in active dynamics at the territory of village Vashlovani. Regulation of surface waters in combination with arrangement of drainage system.
- Washing out of right bank of river Ajaristskali in Shuakhevi municipality (so called 'Lentorgi district'). Full solution of the problem is possible by construction of a 120 m coastal gabion. It is significant that the material needed for the construction of the gabion is available in the riverbed.
- Almost whole territory of village Jalabashvilebi is under risk of landslide processes. For the recovery purposes and for slowing down the process the following measures have been considered – regulation of surface waters, drying up of the wetland area located at the border of landslide, and directing of waters to the neighboring natural water bodies through drainage pipes.
- Left side bank of river Chakvistskali in village Chaisubani of Kobuleti municipality endures intensive erosive washing. To neutralize fully this process it is necessary to construct a 300 m cost protective gabion.

3.4.2 TAP for mudflow protective technology (cleaning and leveling of riverbeds)

Barriers to implementation of this measure are from the group of palliative measures/technologies and practically are the same as for landslide protective measures. Relevantly the TAP for this technology considered the same actions.

3.4.3 TAP for transfer and implementation of advanced technology (software) for mapping of climate change related extreme geological processes and providing long-term forecast of their development

- Preparation of input data for model

1. Statistic analysis of the main factors provoking hazardous geological phenomena is the main activity for the implementation of mapping and forecast system. This analysis itself involves the following actions to be implemented:
2. Re-qualification and updating of data on constant factors, such as geological constitution, lithologic and tectonic data. Assessment of geo-morphological features in connection with climate change. Composition of relevant GIS maps (1: 50 000).
3. Defining of regimes of slowly changeable factors – contemporary tectonic movements – taking into account changes of climatic parameters; assessment of hydro-geological conditions for the purposes of defining the Black Sea iso-static and eco-static changes; inventory of changes taken place in the plant cover.
4. Analysis of rapidly changeable factors – meteorological elements (precipitation, humidity, temperature, sun activity stages, etc.). Analysis and correlation of within-year, seasonal and daily data with regard to mean multi-annual data for the whole observation period for 6 meteorological stations of Ajara.
5. Determination of trends of earthquakes according to years; assessment of the released energy and negative results of earthquakes
6. Changes hydrological regime during the years.
7. Anthropogenic changes in geological environment and activation level of the connected elemental geological processes.
8. Statistical analysis of hazardous geological processes activated by climate change in different years and the damage caused in Ajara pilot region.
9. GIS processing of geo-dynamic map of damages caused by hazardous geological processes provoked and activated by climate changes in Ajara pilot region.

- Acquiring and transfer of suitable for Georgia's condition software(adaptation to the conditions in Georgia) for development of long-term forecasting of hazardous processes.
- Training of local personal and establishment of service centers for consultations on the relevant protective measures.

3.4.4 Brief summary of project ideas for international support (Details in Annex III)

Two project proposals have been developed within the TNA process for this sector: preventive (palliative) measures against landslides and transfer and implementation of hazardous geological events long-term forecasting system. Proposals are presented in Annex III to this report. Objective of the first proposal is to demonstrate the new, community level approach to the implementation of preventive measures against the extreme events and the second proposal should increase the local capacity in monitoring and forecast of landslides and contribute to the effective decision making process.