Activity 5

Geohazards Mapping and Monitoring, GAP Analysis and Recommendations

EGS – OAGS Workshop
Cape Town 8-9.02.2015

40 Years Listening to the Beat of the Earth
Africa is impacted by a multitude of natural and technogenic hazards and disasters such as:

- drought / soil erosion / desertification,
- flooding,
- landsliding,
- volcanic activity,
- earthquakes,
- mining activity,
- waste disposal.
These disasters claim thousands of lives, devastate homes and destroy livelihoods. With more than 40% of the population living below the poverty line, Sub Saharan Africa is also the least-equipped and prepared continent to cope with the impacts of these events. (ICSU, 2007)

In 24 of the 56 African countries geohazards inventory has not been made (T. Shlutter, 2006)
Relevance of the Topic

Drought  Soil erosion  Desertification
Relevance of the Topic

Flood risk
Relevance of the Topic

Landslides

EuroGeoSurveys - The Geological Surveys of Europe
Regional Climate Change Index, looking ahead to 2080–2099

N.B: The Regional Climate Index (RCCI) was estimated for 26 regions of the world and calculated for 20 global models and 3 emission scenarios (A1B, A2 and B1). RCCI is estimated from the mean trend in rainfall and temperature, inter-annual temperature variability, and the relation between regional and global temperature trends, for the dry and wet seasons. The Mediterranean region and north-eastern Europe are the areas of the globe with the highest RCCI (greater than 16).

Source: Giorgi (2006)
Relevance of the Topic

Mining activity

EuroGeoSurveys - The Geological Surveys of Europe
Relevance of the Topic

Waste disposal
The Lusaka (Zambia) vicinties – karstic sinkholes are used for waste disposal
Summary of Questionnaire on Geohazards

Significance of geohazards in the responded countries could be ranked following: flooding; soil erosion/desertification; landsliding; pollution of aquifers and surface environment due to mining activity; waste disposal; earthquakes; volcanic activity.

Technogenic:
1 – pollution of aquifers and surface environment due to mining activity;
2 – waste disposal.

Natural:
3 – volcanic activity;
4 – earthquakes;
5 – landsliding;
6 – flooding;
7 – soil erosion/desertification;
8 – other.
Information sources on geohazards analysis are different in each country:

- Institutional bodies - state authorities (related ministries, bureau of statistics) and local authorities (municipal councils);
- Research centres and universities, geohazards centres and seismic stations, Geological Survey's departments and divisions e.g. Geophysics, Engineering and Environmental Geology;
- Scientific studies and publications on landslides, flash floods, assessment of watersheds vulnerability, etc.

Based on collected information sources on geohazards analysis it is almost obvious that there are not available systematized data portals or data bases.
Gap analysis

Majority of the responded countries has indicated various needs and expectations in the field of geohazards analysis. It could be subdivided to these main areas of interest:

**Methodologies** – classification of geohazards, recommendations, other methodical support.

**Trainings and knowledge** – staff formation and training, radar interferometry training, capacity to forecast earthquake occurrence, skills development in engineering geology, public awareness.

**Equipment** – vehicles, equipment for field surveying, monitoring and early warning (sensors and accessories, seismic stations)

**Mapping** – products of earth observation (digital elevation models (DEM), laser scanning data (LIDAR)), remote sensing data (SPOT imagery) for a country-wide geohazard mapping, active faults mapping, etc.

**Inventory** – identification of hotspot areas.
Training in geohazards should be developed based on proposed scheme of case studies. It will cover:

- Technical properties of rocks and soils.
- Application of remote sensing methods.
- Modern mapping techniques.
- Geo-structural field survey.
- Quality of rock masses.
- Stability analysis for rock and soil slopes.
- Direct investigation techniques.
- Geophysical investigation techniques.
Recommendations

Remote Sensing – Landsat 8
Recommendations
Proposed scope of training

Surface monitoring

Precise GPS instruments
Total stations

Detail geodetic maps
GPS reference systems
Terrestrial laser scanners
Recommendations
Proposed scope of training

Aerial Laser Scanning (ALS)
Relevance of the Topic

DEM data of LIDAR. Minkevičius V., Mikulėnas V. and other
Recommendations
Proposed scope of training
Unmanned Aerial Vehicle (UAV)
Recommendations
Proposed scope of training

Satellite interferometry
Landslide mapping

Landslides inventory

Lithological map

GIS

Landslide susceptibility map
Man made strata contain variety of pollutants, geotechnically are weak, unstable and unpredictable grounds, they are subject of severe liquefaction and landsliding during earthquakes.

Therefore, man made strata are specific techo-geological formations with multiple and various environmental aspects, which must be better understood and managed.
Proposed list of case studies for geohazards analysis has to be reviewed according the criteria of case studies selection.

Training in geohazards should be developed based on proposed scheme of case studies: identification of hotspot areas during basic training in Remote Sensing and Mapping and performing of geohazards inventory in the field. Necessary data has to be captured to fill the description form. Finally data have to be located in the Geodatabase.

After inventory of geohazards the risk assessment to be carried out applying appropriate matrix. It is foreseen to carry out risk analysis in proposed case study areas.
Objective

Identify gaps, problems, develop geohazards activities and cooperation under the EGS-OAGS project.

Thank you for your attention