THE CONTRIBUTION OF EO AND GEO-INFORMATION DATA IN THE ASSESSMENT OF HYDROGEOLOGICAL RISKS IN THE LAKE NYOS REGION, WESTERN CAMEROON

This lake is located in the North West Province of Cameroon, a few kilometers from Nigeria. The most devastating natural disaster that ever occurred in Cameroon's history was on the 22nd of August 1986, when the lake erupted, releasing huge quantities of CO_2. The outburst of gas reached a height of 128 km, and then settled back as a thick dense cloud of about 50 m. High concentrations of CO_2 in nearby villages led to the asphyxiation to death of over 1786 people, more than 3000 cattle and all forms of animal life within a 50 Km radius.

Photo 1: Lake after eruption

Photo 2: Dead cattle in nearby villages

For the villagers and many others at the time, this situation could have been the result of a curse from the gods of the lake. But the truth lies in the quantity of CO_2 that was released at once from the bottom of this crater. Faced therefore with this situation, the government evacuated the site and survivors were resettled in a nearby village called Bwabwa. The lake is also being degassed in order to reduce the amount of pressure at its bottom.

Photo 3: Degasification

However, there is still more CO_2 at the lake's bottom than it was in 1986 before explosion. This implies there could still be another eruption if the degasification process is not hastened. Worst still, the Northern section of the dam that holds back this lake's water has been discovered to be made up of poorly consolidated pyroclastic material and above all, it has cracks and potholes. This section of the dam could fail within the next 10 years.

These risks motivated a team of researchers working within the framework of the TIGER Project to think of ways of using earth observation and geo-information data in assessing hydrogeological risks associated to this lake. The main objective of the team was to detect lineaments and valleys that could facilitate the escape of gas and floods in case of dam failure. Based on these methods, the following findings were made:

- The northern section of this dam has become as thin as 40 m and in case of rupture could let lose over 1 billion cubic meters of water down slope.
- Analysis on radar images revealed that this region has a highly faulted terrain that could facilitate the flow of water and gas along lowland areas that coincide with village communities. An estimated 10 000 people live along such channels and could be washed away by floods in case of this event.
- The village where survivors were resettled after the 1986 disaster falls along a zone that was classified as a high risk zone of flooding.
- After a supervised classification of LANDSAT images for 1978, 1988 and 2001, land cover changes were observed before and after the disaster. Complementing this with field work revealed that this region was abandoned after the disaster, but from the late 1990s, people started massively returning to the site. This is an aggravating factor of risk.

After identifying high risk zones in this region, the TIGER team created a risk assessment map that could serve decision makers in case rehabilitation of the site. (See figure 1).

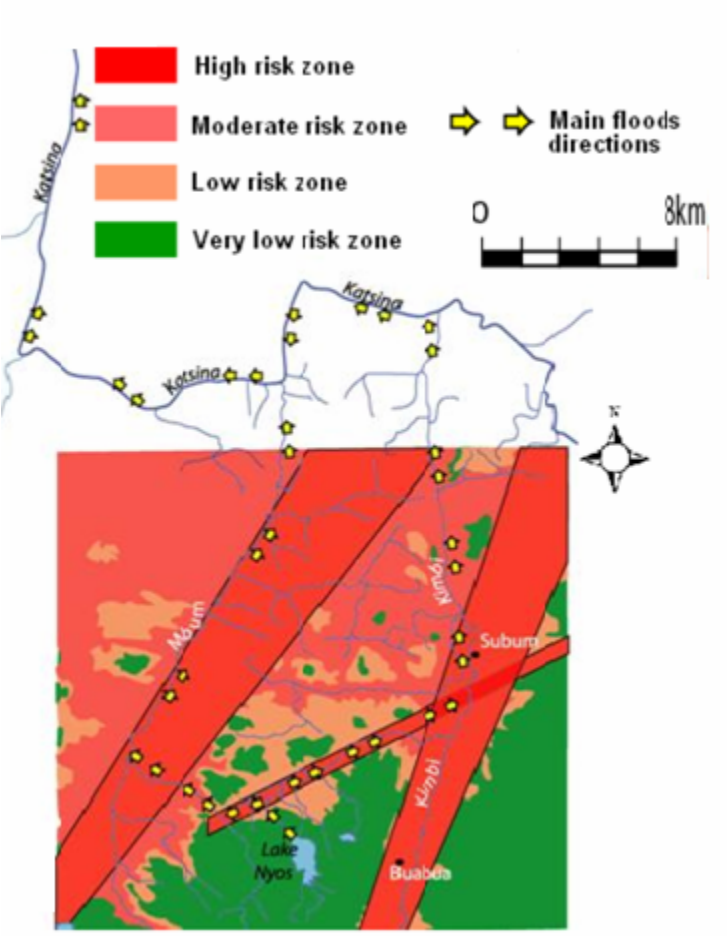

Figure 1: Assessment of risk zones in the lake Nyos region.

The government has over the years shown a lot of laxity in responding to the risks imposed by this lake. However recently, it was earmarked that a concrete dam will be constructed on the fragile section of the lake. As for the degasification process, five pipes that were earlier envisaged for this purpose need to be installed without delay. If these are not done, Pandora's Box could once again release its evils.

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