

## Urban development and natural hazards. Case of ground movement in SIC estate at Mendong (Yaoundé - Cameroon)

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**Abstract:** The water resulting from the collective improvement of the sanitation in SIC estate at Mendong in Yaounde has caused erosion leading to the creation of a deep gully with steep slopes behind the squad of gendarmes. This gully, characterized by important ground movements (landslide, collapse, mudslide) represents a new natural hazard zone in the city of Yaounde. The first geomorphologic, geological and hydrogeological investigations have made possible the drawing of cartography, and to suggest hypothesis on the origin of this gully.

Negative effects resulting from these ground movements are important. They mainly include modification of the topography, loss of farmland, filling of a pond situated at the slope foot.

The sensitisation of the population and public authorities, as well as the drainage and the delimitation of a safety perimeter from the risk zone are some urgent measures to be taken in order to reduce the damage around SIC estate at Mendong.

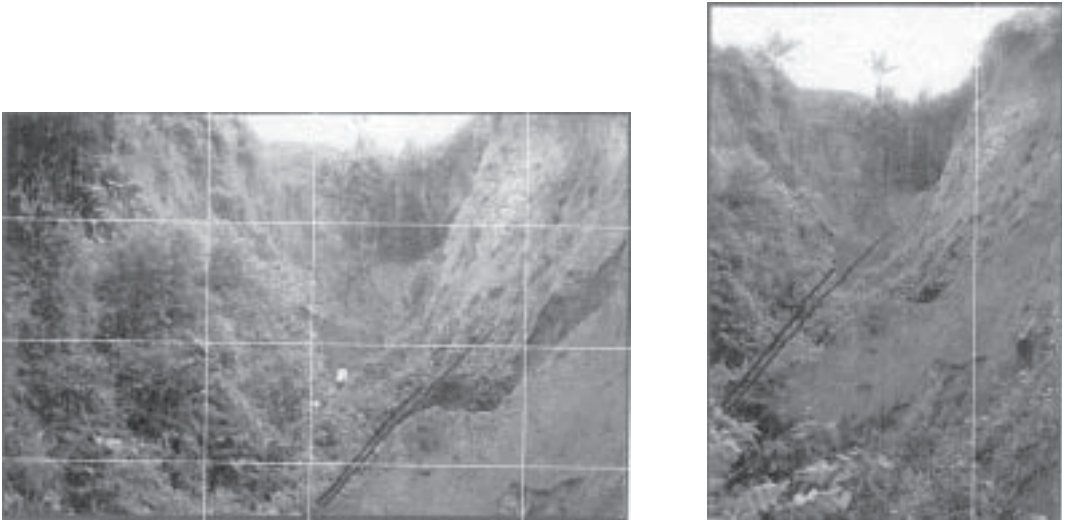
**Key words:** Cameroon, Yaoundé, Mendong, natural hazards, ground failures, drainage, safety perimeter, sensitisation.

### INTRODUCTION

Ground movements, which are peculiar in the city of Yaoundé and its environs, have already involved some victims (TCHOTSOUA, 1993). The diversified form of ground movements leads to the multiplicity of the generator mechanism, which in turn are linked to the diversity of the behaviour of the materials solicited, rocky or movable, and the geological conditions (LEDoux, 1995).

In the Mendong, suburbs of Yaounde, landslide, collapse and mudslide are the ground movements observed. These ground movements are in direct relationships with the planning of the town. With the aim of ameliorating the standard of living of Cameroonian, the government through the "Société Immobilière du Cameroun (SIC)" have undertaken town planning and road construction in various localities of the country for the past decades. In 1978, these works have led the construction of more than 1000 accommodation in the SIC estate at Mendong.

Unfortunately, these works did not include environmental protection measures. Erosion phenomena have caused the ground movements observed at Mendong. This study was therefore undertaken to avert the negative effects resulting from these ground movements. It proposes measures to protect humans, property and natural resources.



**Figure 1.** View of the gully behind the squad of gendarmes (Camp SIC Mendong)

## GULLYING OF MENDONG AND ORIGIN OF GROUND MOVEMENT

The gullying of Mendong (Figure 1) started with an elementary stage, characterized by many phases with increasing importance; grooves or claws, rill, gully. The importance of relief favours concentrated running water and consequently the concomitant incision into rill. The gully evolved by the over digging and the adjusting of many rill.

The Mendong ground movement are primarily linked into water. This water has many origins: meteoric (trickling water, precipitations), ground water and anthropogenic (domestic waste water). Other factors influence the occurrence of ground movement in this area, including slope angle, land use and lithology.

The works of NTANA (2001) showed that soils at Mendong are clayey and sandy. Clayey materials are particularly subjected to the macroscopic deformation of slopes and in general to mass movements (CHENNOUFI, 2000). They keep water the most energetically (TESSIER, 1994), which implies the development of high interstitial pressure in such soils.

The superficial horizon is constituted of gravel materials, which highly favours infiltration. When water reaches the alloteritique and isalteritique horizons, the loss of material becomes more intense, especially as these horizons are sandy. It is appreciated that groundwater affects the engineering geological behaviour of the soils and rocks and can have an important influence on landslides (UROMEIHY AND MAHDAVIFAR, 2000).

## IMPACT OF GROUND MOVEMENT OF MENDONG

The ground movements of Mendong generated the displacement of several volumes of soil on a surface of more than 1000 m<sup>2</sup>. Modifications bound to human activities are characterized by the building of houses around the gully at a very fast rate.

The presence of a non-protected depression with a depth of 15 m, within a radius of almost 15 m, in an area that was stable before 1980, greatly modifies the landscape. Some big trees have been felled which lead to reduction in the biodiversity of the field. The exposure of the naked soil to rainfall increases the erosion. This leads to a loss of fertility of the soil. More, this area represents an obstacle to the circulation of animals and humans being. Accumulation of sediment downstream and the filling of a pond situated at the slope foot.

## DISCUSSION AND CONCLUSION

The ground movements of SIC estate at Mendong has brought about the displacement of a significant volume of ground. This ground displacement has favours the formation of a gully with a depth of 15 m. This gully represents a high natural hazard zone, consequence of a mindless management of the field by humans who unconsciously, develop the discharge of water in an unsuitable area.

The gully of Mendong permanently receives important part of wastewater, through an open canalisation, to which running water in raining season is added. To limit the dampening of the soil up to saturation, as well as the landslide plan, we must intervene, on the mode of drainage upstream. The water discharge in the gully could be prevented by collecting and evacuating in pipe from the surface. Furthermore, we could study the condition of the continuation of the canalisation up to downstream of the gully.

While waiting for the feasibility studies of the previous actions, we recommend at this point:

- The delimitation of a safety perimeter in which some activities such as agriculture and the building of houses would be prohibited;
- The sensitisation of the population and the council authorities to the hazards involved, through the media, workshops and round table discussions. In fact, the speed at which the inhabitants are building on that unstable slope demonstrates that they are unaware of the hazards involved. We agree with the proposition of ROOSE (1999), that only the government possesses the technical, financial and legal means to understand the problem of landslide, which is catastrophic, as well as to impose restrictions on the use of land that is subject to this major risk of ground movements;
- The continuation of research on the field is necessary in order to prevent such environmental disasters, caused by poor drainage system, considering the present situation in Mendong in Cameroon.

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