



## Volcano Risk Reduction: A Case Study from Goma (DRC)

The Democratic Republic of Congo (DRC) is exposed to a high risk from active volcanoes, which have erupted repeatedly over the last 6 years with disastrous impacts. The Nyiragongo Volcano is an immense strato-volcano with a height of 3.470m. It is well known for the permanent activity of its lava lake in the main crater.

The January 2002 eruption of the Nyiragongo volcano has had devastating impacts on the city of Goma, destroying 18% of its surface forcing the evacuation of some 300,000 people and leaving 120,000 homeless. A total of 110 people lost their lives as an immediate consequence of the eruption, and approximately 80% of the local economy has been destroyed. In November of 2002, the volcanic activity in the Nyiragongo crater recommenced, with the reappearance of an active lava lake. Since then, the level of activity is regularly growing, putting at risk an estimated population of some 460,000 people.

The permanency of the volcanic activity also has a very deep impact on the environment. A huge volcanic gas plume is constantly emitted by the crater with Sulfur Dioxide (SO<sub>2</sub>) quantities ranging from 12,000 to 50,000 metric tons per day, a figure that represents approximately 50% of the total volcanic SO<sub>2</sub> emitted by all volcanoes around the world. As a consequence, acid rains are burning forests and crops, and very high concentrations of fluoride are polluting drinking water.

This constant volcanic activity could last for years or decades, exposing the population to direct volcanic risks with a possible new eruption, or indirect impacts like damages to crops or the pollution of air and water.

### The Initiative

The Inter-Agency Cooperation for Disaster Reduction in the Goma/North Kivu Area is a joint undertaking of UNDP, ISDR and OCHA. The main goal of the program is to coordinate and integrate activities towards the development of disaster reduction capacities within the Goma area. The specific activities include:

Support to the Goma Volcano Observatory (GVO) through capacity strengthening and developing equipment and monitoring networks.

Support to adequate and permanent surveillance of the volcano activity, as well as support to volcanic hazard appraisal and risk assessment.

Development of early warning systems for the population at risk.

Development and application of integrated risk management tools.

Increasing the commitment and participation of local authorities and civil society.

Public education to strengthen the active adoption of disaster reduction concerns at the community level.

### Achievements

For the first time since 1996, the GVO is functioning full time.

Since the last eruption in January 2002, the Nyiragongo volcano is permanently under surveillance.

Monitoring networks have been deployed or strengthened: 7 seismic stations with digital seismometers radio-connected in real time to GVO; ground deformation surveillance network; thermal anomalies surveillance network; geochemical survey network.

6 members of the Congolese GVO staff have been trained formally, on the job and also abroad (Hawaii, Italy).

12 experts from different countries (France, Italy, USA, England, and Denmark) stayed in GVO and developed new techniques jointly with the local staff.

A meeting of national and international experts who worked on the Nyiragongo Volcano was held to establish the present level of knowledge on the volcano and to determine new paths in volcano surveillance. An important result is the

establishment of a Technical and Scientific Advisory Committee giving recommendations to the UN Interagency Programme and to GVO.

A preliminary volcanic hazard map has been prepared with simulations of all potential lava flows in the area.

An early warning system has been initiated.

A dedicated video program has been developed on volcanic hazards around the Virunga Volcanoes; it is now the most efficient communication tool.

Public education sessions on volcanoes and related risks have been organized by a team of 15 animators. They have been working within the city of Goma and its surroundings. In 2 years, a total of 260,000 beneficiaries have been following these sessions.

A seminar gathering of all professors and teachers in geography or natural sciences has been organized for a readjustment of knowledge and pedagogy in earth sciences. It has been decided to collect all materials used during the seminar and to edit a book designated for the teachers as well as all students from secondary schools. These books could be used for a total of 25,000 children every year.

90,000 leaflets in French and Swahili have been printed and distributed.

55 panels explaining the alert system and showing the present alert level have been set up in several public places and schools.

Regular weekly messages are broadcasted by the two existing local radio networks. Some messages are being relayed by the national network.

## Lessons Learned

The main lesson is that volcano emergencies are "on-going or chronic emergencies"; the active volcano is developing its own pattern, with many changes in the type or in the level of activity. But this activity is constant, putting people at risk for many years or decades - even centuries. The only response is permanent surveillance and vigilance, accompanied by permanent community awareness. Within this framework, education and communication must be continuous.

Another important lesson is that awareness raising is much more effective if tools are developed for specific problems and/or population groups. In the past, general information materials about volcanoes and volcanic risks were used in Goma. This approach changed for the first time with the production of a specific video on Virunga, which was much more effective because it raised awareness on the particularities of the local volcanoes. Also communication tools were developed in a more adapted manner. 3D-models, for example, were found to be much better understood by the population than maps.

The main challenge is to implement such a program in an area of conflict, where the population and authorities are facing many different threats and their attention is easily diverted to other pressing problems.

Another challenge is maintaining field-developed networks with sufficient equipment and to pursue field work in an area with a high level of insecurity (attacks and looting are regular problems).

## Recommendations

The most important recommendation is to further pursue the present program and to maintain sufficient levels of support for the GVO. The volcano surveillance capacities must be reinforced and strengthened, since good knowledge of the volcano's activity and its monitoring is needed to define the level of risk from which the population should be protected. Volcano risk is changing continuously in type, time, and in geographical repartition, so these changes have to be carefully followed for better understanding and appraisal.

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