GEOGRAPHICAL INFORMATION SYSTEM SUPPORT FOR EBOLA RESPONSE.

Case situation

Background

In March 2014, viral haemorrhagic broke out in southern Guinea, near the city of Guéckédou. The virus was quickly identified as Ebola haemorrhagic fever and Médecins Sans Frontières (MSF) deployed a team to assist the existing programme staff with the response. MSF Switzerland (MSF-CH) has been running a malaria programme in the area since 2010.

In support of the epidemiological team, MSF-CH deployed a dedicated Geographic Information Systems (GIS) officer. While MSF staff have been using maps and GIS technology for many years, the use of dedicated GIS staff in the field is still very uncommon.

The decision to send a dedicated GIS officer to Guinea was informed by a study[1] on the use of GIS within MSF, which had identified epidemiology as "the domain where GIS can bring the most positive evolution".

Geographic Information Systems (GIS)

The term GIS in this case study encompasses any use of geographical information, or maps, ranging from the basic use of maps in the field to the use of Global Positioning Systems (GPS), remote sensing (satellite imagery), and all kinds of geo-referenced information (locations of patients, particular infrastructures, etc).

This summary provide from the first case study written in July 2014, available for download here

CartONG Technical Support of MSF GIS UNIT

Analysing GIS data and producing detailed, topical maps is a technical skill that is not readily available within MSF. To explore the use of GIS and to build capacity within the organisation, MSF-CH signed a framework agreement with the French NGO CartONG in late 2013. In addition to building and maintaining technical infrastructure for MSF-CH, this agreement includes remote mapping support, as well as the provision of staff embedded in MSF field missions. CartONG is therefore seen as technical support for the GIS UNIT of MSF-CH.

Action proposed

During the one year of missions, the GIS officers produced lot of maps for this previously very poorly mapped area. The maps included basic orientation maps that showed roads, landmarks and villages but also specialized maps that visualized population density or spread of the disease. Both field and headquarters staff emphasized that having a

[1] "State of art and opportunities using Geographic Information Systems in MSF" (2013)

dedicated GIS officer in the field was a major asset that had a significant positive impact on the operation.

Universally they identified two outputs as the most useful:

Localization:

With the help of a newly created database and subsequently produced maps, the GIS officers were able to pinpoint the exact location of villages and identify villages that had the same name but were in different parts of the prefecture.

Visualization:

A weekly mapping of confirmed and suspected Ebola cases helped translate the progression of the epidemic from technical data into an easy-to-grasp map. As a result, staff at all levels had a better understanding of the emergency.

Methodology

The GIS officer initially focused on producing base maps of the affected region and its most important towns. At that point, only very basic maps existed of the prefecture of Guéckédou, which had been identified as the main field location for the Ebola response. Existing maps listed main town locations, one major road and also included low-quality paper-drawn city maps (Figure 1).

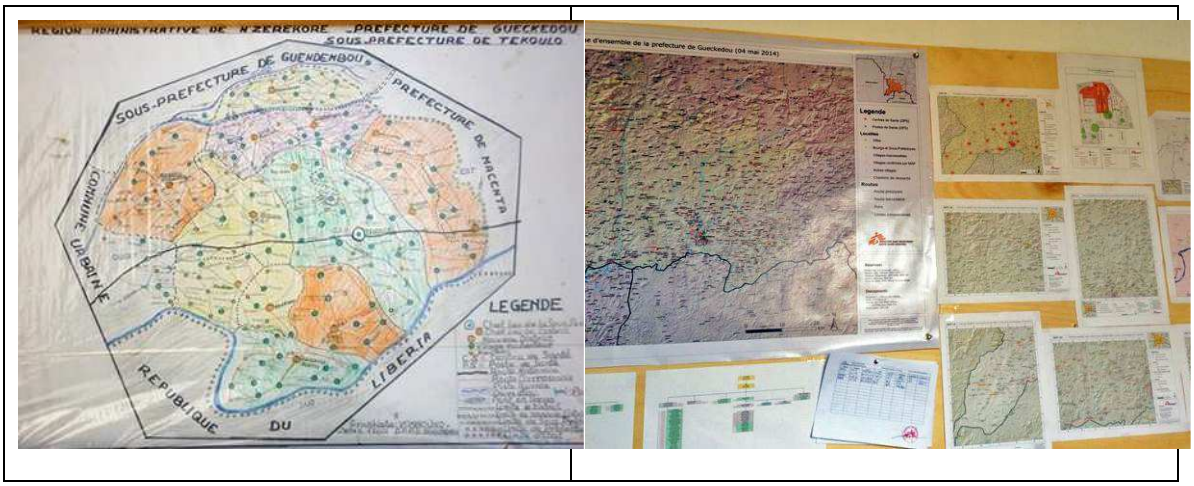

Figure 1 Existing map of Guéckédou prior to the Emergency Onset(left), Maps created by the first GIS (right)

Satellite imagery was rapidly acquired with special web licence for three priority cities (Guéckédou, Macenta, and Kissidougou). Through the volunteers of OpenStreetMap and the Humanitarian OpenStreetMap Team (HOT), satellite images that had been acquired by MSF-CH were quickly turned into digital maps hosted on OpenStreetMap servers accessible to all volunteer mappers of the community so they could manually digitize the cities with high resolution satellite imagery as background map.

The three towns were mapped in less than three days. Within five days, 244 volunteers had mapped more than 90,000 buildings (Figure 2).

Figure 2 Evolution of the Mapping of Gueckedou town within the first few hours of the activation, and a month later.

As soon as epidemiological data became available, the GIS officer started to produce weekly updates of Ebola hotspots that showed both the number of new cases in the previous week, as well as the total number of cases since the beginning of the epidemic. This weekly, visual overview was appreciated by all the field and headquarters staff who were interviewed. As one respondent put it: "That map translated the scientific into the operational."

Various maps were uploaded on the Map Centre, the platform for internal dissemination, created by CartONG for MSF GIS Unit. **Figure 3**

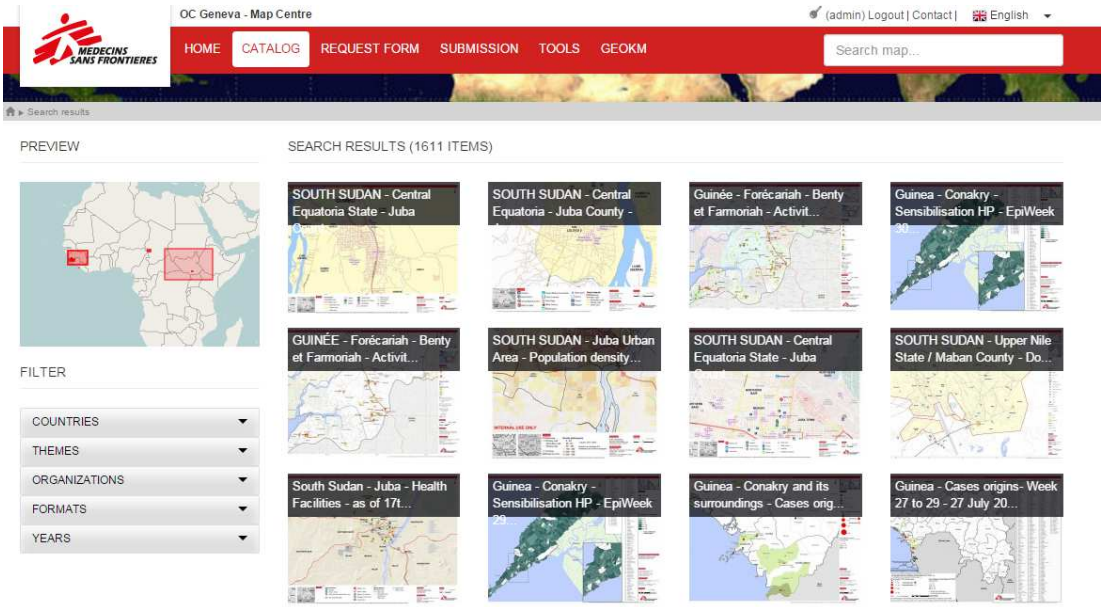

Figure 3: Overview of the MSF Map Centre, online dissemination tool.

Results

In all three countries the GIS officer produced weekly updates of Ebola hotspots that showed both the number of new cases in the previous week, as well as the total number of cases since the beginning of the epidemic. (**Figure 4**) A similar map showed new cases within the last seven and the last 21 days - the incubation period for EVD.

As with the base maps, having these maps and being able to share them with other actors helped build relationships and obtain data from other actors. These maps gave MSF more credibility in meetings because the information looked more official when visualised on a professional looking map.

Line lists

The basis of many epidemiological maps produced by the GIS officers were "line lists" that contained basic patient information such as their place of residence. Matching this information with the list/database of know locations was the first step in visualizing new cases on maps.

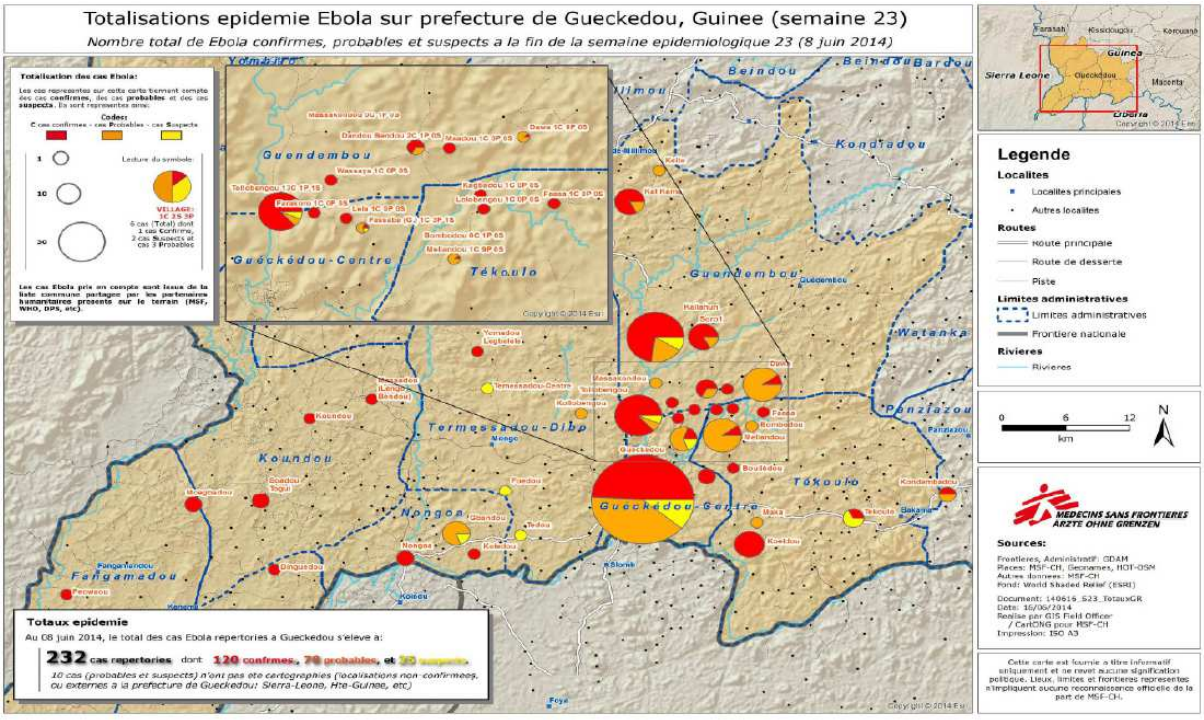

Figure 2: Regularly updates maps like these helped staff understand the situation better.

Figure 4: Type of weekly epidemiologic maps produced for MSF.

Geographic randomization

The GIS officers helped two epidemiologists to improve the scientific rigour of their epidemiological surveys by randomly selecting households on satellite images.

Conclusions.

At the beginning of the response, the base maps and the localization of villages were universally seen as the most useful outputs. As time progressed, epidemiological maps increased in importance.

All MSF Staff interviewees emphasized that the GIS officers were able to add significant value to the operation. Most programme staff stressed that having a GIS officer in the field was a significant time saver which enabled them to dedicate more time to their core competencies and improve or increase programmed delivery. The departments that benefitted the most from the GIS officers' presence were logistics, epidemiology and health promotion.

Good maps are valuable to all stakeholders in emergencies. By sharing high quality maps, MSF teams were able to more build relationships more quickly and more easily and to generate goodwill with government officials and other humanitarian actors. In some cases this also prompted other actors to be more open about their data.

Physical proximity increases information exchange, formal and informal communication, and teamwork. Where possible, GIS officers should share the space with the unit that needs their services most. This can also mean that GIS officers rotate depending on where GIS can add the most value, depending on the phase of the operation

CartONG as technical support of the MSF GIS Unit should continue to take advantage of crowdsourcing for the creation of base maps. To facilitate this process, CartONG, on behalf of MSF-CH GIS UNIT, should engage in a dialogue with the Humanitarian OpenStreetMap team to better define the expectations from both sides.