Satellite Imaging: A Useful Tool for Camp Planners?

by **HPN**

To respond effectively to a major crisis, agency personnel managing relief operations need detailed knowledge of the area in which they are working. Logisticians need to know where the roads are, what state they are in and whether they are passable in the rains. Information on the location and carrying capacity of rivers is also needed, to determine whether they can be used for transporting supplies to those inaccessible by road.

Camp planners need to know where there is flat land, easily reached by road, with good drainage and nearby water and fuelwood supplies. The terrain should be suitable for the building of latrines and access roads.

Where refugees are fleeing conflict in their country, camps should be away from border areas, so that they cannot be used as cover by belligerent elements, or be a target for attack. To avoid environmental damage, they should be self-supporting in terms of access to fuelwood, and should not be placed close to existing settlements, where competition for natural resources may lead to conflict.

The importance of such issues to camp dwellers, local inhabitants and relief agencies cannot be underestimated.

When over 2 million people fled Rwanda in 1994, relief agencies and the governments of neighbouring countries were caught largely unawares. Although potential sites for camps had been identified in Eastern Zaire, most refugees ended up settling spontaneously.

As a result, camps were established in areas which were unsuitable, with serious consequences: thousands died of dehydration on the long walk between the Rwanda-Zaire border at Goma, and Katale camp, some 50 kilometres away with no access to water en route; two hundred thousand refugees settled at Kibumba, close to the Rwandan border, in an area with no local supply of water - millions of dollars have subsequently been spent in tankering water to this camp; the areas around Benaco camp in Ngara have been almost totally stripped of forest cover, and the host population has suffered considerably as a result.

It is rare that a humanitarian agency will find itself operating in an area where no information on local conditions is available: government departments may be able to provide maps; traders will know about the state of the roads; and farmers will know about the terrain and rainfall. Such local information is likely to be invaluable.

In addition, other humanitarian organisations may already have worked in the area, and have conducted surveys and written reports. Information that does exist, however, may either not be readily available, or be in a form that does not allow for easy analysis, particularly if time is short. (The availability of new Internet technology and appropriate software can improve the management of field-level information, and is discussed in the article on geographical information systems (GIS), elsewhere in this newsletter).

There are also situations where data collection is particularly difficult: where population flows are occurring over a wide area, an agency may simply not have the financial and human resources necessary to undertake visits to investigate local conditions; conflict in the area may make travel too dangerous; reliable maps may be unavailable, either because they have not been up-dated since colonial times, or because their distribution is restricted due to local military sensitivities.

In some cases, fairly detailed maps can be obtained outside the region, or even through the Internet. Response.Net, a non-profit subsidiary of DeLorme Mapping (see the article on GIS for contact details) can provide digitised maps of any region in the world free of charge to humanitarian organisations.

These maps are of enormous potential value to the managers of relief operations. The scale of the maps available varies from region to region, however, and may not always be sufficient for the needs of site planners or water engineers, who need detailed information on gradient, terrain, geology, vegetation and water sources. (Although XMAP, the software mapping package available (on CD) from Response.Net, includes information on elevation at 3 metre intervals. Using two CDS simultaneously, in a ‘CD Jukebox’ it is possible to work out the gradient of a particular site.)

Where the available maps do not provide the detail required, satellite imaging can be a useful complement. Skilled analysts can identify flat areas and flood plains, distinguish forest from scrub and brush, predict soil types in semi-arid areas, locate areas of higher population density and identify major infrastructure.

The process can, however, be fairly expensive. While low resolution satellite images are generally obtainable free of charge, these are

inadequate for many purposes, and high resolution images are required. Ten-year-old high-resolution images can be obtained relatively cheaply (for example, 180km x 180km images can be obtained for US $1,500 from US-based Landsat), but, at current rates, up-to-date images cost approximately US $3,300 for a 60km x 60km image. In areas of high interest, other agencies may already have purchased such images, and so they can be obtained at lower cost.

As well as the expense involved, the process can take some time. Up-to-date high-resolution images require the satellite to be over the area of interest, and cloud cover at a minimum (although radar data can still be useful for certain purposes). Satellites pass over non-strategic parts of the world on average only every 16 days. To arrange for a high-resolution picture can, therefore, take a number of weeks. (Weather satellite photographs are available on a daily basis, but are of low resolution.)

Commercial satellite images are available either on CD-Rom in digital form or as photographic hard copy. The latter gives a sharper picture but the advantage of using a digitised format is that the image can easily be processed, copied many times and distributed by telephone links between agencies, and between agency HQ and field staff.

A number of humanitarian agencies have already gained experience of using satellite technology. During the early stages of the Great Lakes crisis, OXFAM UK commissioned a hydrogeologist to undertake a desk-study involving satellite images and geological maps.

This enabled them to locate water sources (as well as other landmarks). This work was then followed up by work in the field. UNHCR were also interested in using satellite images to monitor the use of fuelwood resources around Ngara, but were unable to find the necessary funding.

To effectively manage humanitarian programmes, agency personnel need up-to-date, reliable sources of information. As part of a wider information-gathering strategy, satellite imaging may have a useful role to play, particularly where access to reliable maps is restricted, or where conflict makes terrestrial work dangerous. Timing considerations suggest, however, that the process is likely to be too slow for crises where events are unfolding rapidly.

While aerial data gathering may be an alternative in such emergencies, particularly where large population flows are occurring over a wide area, the most valuable use of satellite data would seem to be found in early-warning and preparedness systems, set-up well in advance of any crisis.

At relatively low-cost, this technology could be used to identify the most likely sites for refugee camps, allowing field staff to then discriminate between the sites selected on the basis of more traditional terrestrially-based information gathering processes.