GI for the Public: the Terrorist

Services and Information Corrigible

Due to the recent large-scale disastrous events - be they natural, as the Asian tsunami Christmas 2004, or man-made, as the WTC attack of September 2001 or the London bombings of July 2005 - , disaster response tool development is on the top of government agendas. In this paper we concentrate on a specific subset of tools, namely geo-information (GI) support and services for the public.

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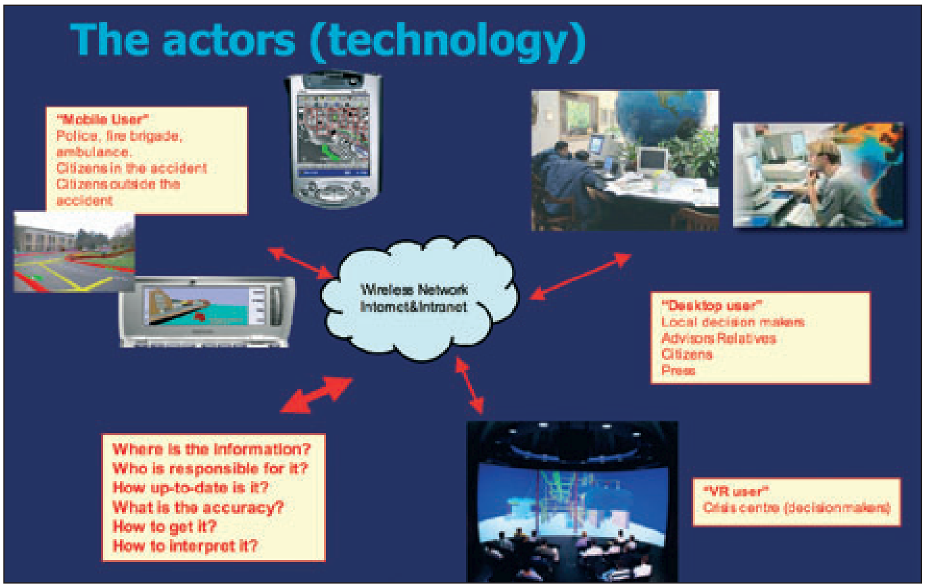

Figure 1: Users in disaster management with respect to the equipment (from Zlatanova and Holweg 2004).

In time of a disaster everyone is looking for information: from decision-makers and specialists fighting with the emergency situation to regular citizens directly or indirectly involved in the disaster, or the general public with its general information needs. Geo-information is of critical importance for all these groups. However, geo-information needs and availability vary drastically depending on the role of the user and priority of tasks to be performed.
In this case we concentrate on the largest user group: the public, that is citizens that are not connected to any decision and communication hierarchy. What are their geo-information needs, and what is the potential of geo-information to cater for these needs?
During the Vespucci Summer School on "Geographic Dimensions of Risk Management", which took place just when the first London bombings happened, a group of researchers took the occasion to follow closely all available information resources, and to compare information provision with anticipated information needs. The results of the analysis are presented here and should be indicative for this kind of potentially large-scale disasters.

Classification of Users

Due to the dynamic nature and complexity of tasks in crisis management, it has always been a problem to outline and classify the group of people that will make use of or need disaster management. Zlatanova and Holweg (2004) distinguish between four groups of users according to the environment they are working with, and therefore, related to their technical equipment: virtual reality clients, mobile clients, desktop clients and web clients, see Figure 1.
This classification does not consider the actual role of the user, and thus, does not reveal information needs. Therefore, this paper distinguishes between:

- decision-makers, responding to the event and coordinating the work between different teams;
- consultants, giving advise on specific aspects and issues, for example type of explosives;
- emergency response workers in the field, like police, fire brigade, ambulance, red cross;
- victims: serious injuries that will be transported by specialized transport or have to stay in locally organized first aid centers;
- journalists;
- the general public.

The general public can be further subdivided into several groups:

- citizens directly involved but without injuries who can leave the area of the event by themselves;
- citizens who are indirectly affected, for example blocked in certain areas due to traffic jams or unavailable public transport;
- citizens outside the vicinity of the event.

The Vespucci Summer School

This year the annual Summer Schools of the Vespucci Initiative (www.vespucci.org) contained a module that focused on Geographic Dimensions of Risk Management. It was a sad coincidence that this module had its main practical exercise scheduled for the afternoon of July 7th, a few hours after the London attacks. The instructors decided spontaneously to cancel the planned dry run on a fictive nuclear disaster in the Netherlands and to replace it with an actual information gathering and reviewing exercise around the London events.
While this allowed to respect the feelings and pre-occupations of participants (some of whom came from London or had relatives there), it had a strong motivating and grounding effect on the exercise. The result, on which this paper reflects, was thus in line with the goals of the Vespucci Initiative to foster learning and research experiences of highest possible effect and relevance.

Attack in London

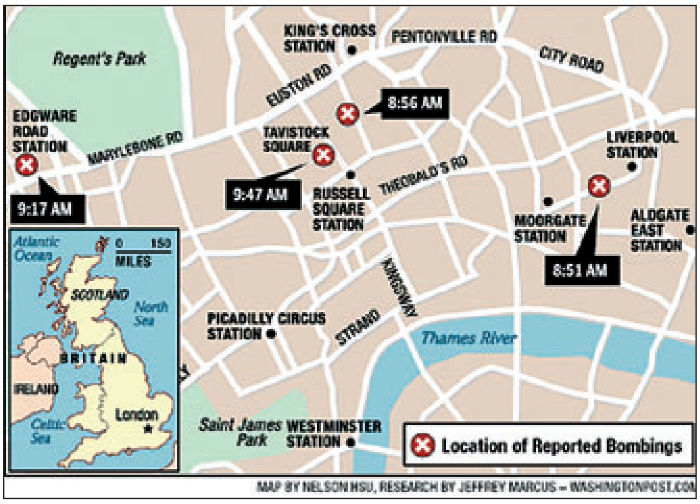

Figure 2: An early map of the reported London bombings (Washington Post, 2005).

Figure 3: Web maps of the day of the event (up), and a month after (below) (BBC, 2005).

It should be noticed that the general public (with small exceptions) is in possession of mobile and desktop electronic equipment in addition to the other information media such as radio, TV and - with delay - the press.

GI Supplied to the Public

Observing the news tickers of the day showed that information in general is provided by three resources: official disaster response authorities, journalists, and the public itself. The public of London and of the rest of the world was informed by official authorities through press conferences or press releases, as picked up by the media (radio, TV, the Web, and, delayed, by newspapers).

The primary role of authorities is assessment prior to information. At 10:21, 90 minutes after the first bombing, Scotland Yard reports “multiple explosions” without being specific about locations. At 11:18 London's Metropolitan Police Commissioner Sir Ian Blair tells the BBC that he knows of “about six explosions”, and names affected areas, but says it is “still a confusing situation”. He informs that all of London's transport is currently disabled.

Journalists investigated independently from the official authorities, and reported from the affected areas, or interviewed eye witnesses. For example, at 10:25 - long before Ian Blair’s statement - the Press Association reported of two buses damaged in explosions, one in Russell Square and another in Tavistock Square. At the same time news was also spread by the general public using text messaging, phone calls, and private Web logs. Soon maps appeared on the Web and on TV, first as plain images. One of these maps, see Figure 2, shows the places of four bombings, with the first reported times. The map shows an inset to locate London, but a relation between the inset and the main map is not obvious. The map is designed to communicate primarily the temporal sequence. In contrast, Figure 3 (up) shows two insets that tell the public better the extent of the main map. It sets the timing aside to emphasize location. Figure 3 (below) shows the same map revised, and now hyperlinked with additional information. Figure 4 shows an integration of locations with individual navigation possibilities, and additional information to the single locations. This map was provided as early as the day after the bombings, using the proprietary technology of Google Earth.

GI Needs of the Public

Studying the available evidences of the London terror attack, we distinguish between three fundamental questions that are of interest for the general public, all of them having a location- or direction-related component:

- What is the general picture: what happened where and when?
- Did it affect friends or relatives: where are my friends?
- How does it affect me: do I have to move, for example evacuate, or will I be limited to move, such as by discontinued public transportation, or by congestion?

The first question has to be answered by the disaster management authorities after assessment. The first information released was exactly of the kind what happened where and when: a report of an “accident” in the London Underground. The primary resources for this information were the station attendants of the closest underground stations.

Another resource of information for the authorities was the dense closed circuit television surveillance system (and similar for the public: recordings of Web cams), which gained even more attention after the attack when post-event analysis started for crime investigation. However, cameras were not present in the tunnels, and hence could only give indirect clues. It took some time for the authorities to get a clear picture of the dynamic situation, and the early picture for the public was confused by information from other resources. The second question could not be served by the authorities. After the events the mobile phone network was soon overloaded, intensified by the mobile operators’ decision to reserve network capacity for emergency management. Under these circumstances any location-based service, such as friend finder services, are failing. However, the networks did not break down. In this situation private Web logs turned out to be a viable communication alternative; the Internet has an infrastructure better scaling to the demand than the hierarchic GSM/UMTS systems. In this respect Web-enabled smart phone technology opens at least the opportunity to offer alternative services in the future. The third question is the biggest challenge, considering at once central traffic management, and the individual routing information needs for evacuation or traveling. In London the situation was comparatively simple since all public transportation was grounded, and thus no redirection was required. Additionally the public was told to avoid traveling through London if possible. Evacuation of trains and train stations was locally organized. The general problem was communicating this information to the people. Some changes and additional services were announced via the radio but many remained on Web sites and thus were not available to the people on the street.

What GI Can Do for the Public

The London case study has clearly revealed that the general public needs geo-information services that answer the following questions:
- What kind of GI services?
- Who is going to provide them? Specialized emergency response centers, communication companies, geo-servers?
- How will they communicate to the public? TV, Web, hand-held devices, radio, or combinations of them?

In the following, we will address the GI services with respect to the three sub-groups of the general public.

Group 1: Directly involved citizens
Being in the heart of the event, the first question is 'where do I go?' and the expected answer is guidance to a safe place. Providing an appropriate evacuation is very much related to the location and the nature of the event. The terrorist attack in London has shown typical patterns of situations in closed spaces such as undergrounds, airports or shopping centers:
- Large concentration of people and thus large potential for injuries, panic, blockages and losing control of the situation;
- Lack of detailed information about the construction, in terms of plans or maps, and thus increasing the chance of personal disorientation;
- Limited exits and limited safe routes;
- Lack of systems, like GNSS, telecommunication, and WLAN, for positioning and guiding;
- Failures in telecommunication coverage.

Currently, the most common way for evacuation is through evacuation plans (compulsory for all closed spaces), green light signs and sound or voice systems. Many buildings are already equipped with quite elaborated alarm systems (Galea et al, 1999), but still little is done on systems for intelligent evacuation. The most important disadvantages of the current systems are as follows (Pu and Zlatanova, 2005):
- When available, the dynamic monitoring of safe corridors and stairs is hardly coupled with the evacuation signs. Provided evacuation plans are in general static;
- No information about the number of people directed to a certain exit (via the green light sights);
- No information about gender, age, or disabilities of the persons to be evacuated.

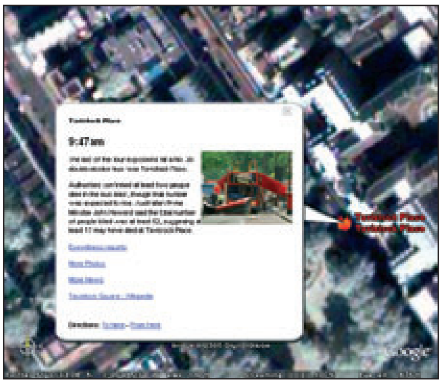

Figure 4: Public geographic information from the day after the event (ABC, 2005 on Google Earth).

Developing intelligent algorithms by itself is not going to resolve the information need. Safe routes have to be computed by a responsible institution and communicated to the public in an appropriate manner. The trend is having all the closed spaces equipped with intelligent systems for alarm and navigation, but since this is not going to be achieved in the close future communicating approaches from outside the event still have to be considered. In the London case, the responsible institution is the crisis response center that possesses the most updated view on the disaster and is in contact with the rescue units, such as police, fire brigade, and ambulance. Having in mind that the citizens do not have other equipment than hand-held devices, all the evacuation information should be provided in form of SMS (text guidance) and simple maps (for PDA). It has to be considered though that such an approach will cause overloads in the telecommunication network.

Group 2: Indirectly involved citizens
Most probably this group is safe but unable to reach certain places due to traffic jams, or destroyed or flooded route sections. People are prepared to wait in a traffic jam if they receive sufficient, reliable and consistent information on what is the reason for the delay. They need maps with alternative routes and updates on public transport services. This information can be collected and provided via Web sites, radio and TV, such that they are accessible en-route with mobile devices. Since this group can be traveling by any mode (car, motorcycle, bicycle, pedestrian), and can be anywhere, the media and the message have to be chosen accordingly. The most critical question here is who should take responsibility for collecting and processing all available information, and calculate alternative routes. The disaster response center is not the right institution since they concentrate on the area of the event. Apparently transportation institutions, equipped with the necessary software and hardware, should process and communicate this information.

Group 3: Citizens outside the event
These citizens need information about the event, and about their relatives and friends. This group of people relies largely on the media—first the Web, TV and radio—to get information about the event, and telephones to obtain information about friends and relatives.
The common information needs for such a group can be easily satisfied with maps as shown above, organized appropriately on the Web. Again the most critical question is who should provide these Web pages. In the case of London this was done by press Web sites, with their usual schematic low-resolution maps. Apparently large geo-providers, who already participate in the handling of the disaster situation by providing data for the crisis response center, could prepare appropriate maps and provide it to the press or link it with services such as Google Earth or VirtualEarth.
Information about friends and relatives can be obtained by personal contacts.
Information about injured persons could be provided on a Web site opened immediately after any disaster for tracking patients. An example of such a system is IRIS developed by several Dutch companies in cooperation with the Red Cross.

Conclusions

- Currently provided geo-information is not sufficient;
- More research is needed on intelligent evacuation, especially indoor;
- GI services require initiative and coordination of different organizations;
- Web, TV, and radio are the most reliable ways to communicate geo-information to the people outside the event. This is not sufficient for citizens directly or indirectly involved. For them GI services should be further developed;
- GI services have to be organized and made known to the general public in the case of a disaster;
- Reliability of the geo-information and other information will need to come from the institutions that publish them.

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More information on the London terrorist attack can be found on
http://news.bbc.co.uk/1/shared/spl/hi/uk/05/london_blasts/what_happened/html/default.stm ■