Mine Risk Management by Mapping

This article discusses the issues and benefits involved in attaining information on local areas containing explosive remnants of war through the local population that use these areas, a process called direct mapping. Once collected, data is used to discern which areas, based on the local population's activities, deserve the highest clearance priorities. This process is described through in-depth analysis of the steps involved.

by Russell Gasser [Humanitarian Technology Consulting Ltd.], and Goran Knežević and Michael Carrier [Handicap International]

Landmines and unexploded ordnance make life difficult for people living in contaminated areas—not only in terms of the risk of injury or death, but in terms of the negative economic, social and development impacts. Mines may obstruct land needed for grazing animals. Children may not receive an education because the road on which their bus must travel may contain mines. Visiting the neighbors may involve a long detour to avoid a path suspected to be contaminated with mines. In colder climates, wood for winter fuel may be unavailable due to a mine-contaminated forest.

Mine clearance is also expensive, slow and can take years to complete. People in affected areas often suffer while waiting for clearance. When they cannot use land, roads and services, family income is reduced, and many development organizations will not begin projects that would improve employment and family income until land is cleared. In desperation, people start to use suspected-hazardous areas or are forced to leave the area and continue life as refugees.

Mine Risk Management by Mapping

Impact-assessment methods have been used to help define risk and prioritize demining but have not usually been quick, intuitive or easy. Mine Risk Management by Mapping is a simple and effective solution shown to work alongside existing survey methods used to gather local information. Adriana Moreno and Russell Gasser initially developed the direct mapping method for the Colombia Landmine Impact Survey in 2009, and Russell Gasser and Goran Knežević later adapted it to Mine Risk Management by Mapping in Bosnia and Herzegovina (BiH) in 2010. The method's first field trials were successful, far exceeding expectations in Colombia and in BiH. The technique fits well with the use of Geographic Information Systems but can also be used as a stand-alone method.

Identifying the Risk

Mine-risk management starts by defining risk as the combination of an ERW hazard and human activity (although there are other definitions of risk, Mine Risk Management by Mapping employs this one). Risk can be controlled by reducing the hazard (demining) or modifying the activity (clearly marking/fencing SHAs and using mine-risk education to prevent locals from entering known hazardous areas). Combining hazard and activity management can be effective, especially if mine clearance will take several years to complete. Any measures that improve the enforced co-existence of people and mines can have a significant positive effect on the quality of life of local people and reduce the risks they take.

Gathering the Data

MRMM is easy to implement, as it requires only a map, transparent overlays and marker pens. Basically, it is a pen-and-paper extension of a multi-layer GIS. A map of the local area is overlaid with a sheet of transparent plastic. The map can be a quality sketch or, if possible, an ordinary large-scale map. The process, however, relies heavily on the local population's ability to understand maps, and instruction on how to read a map may be necessary. A marker-pen is used to draw human activities, such as the paths that locals use and the frequency of use (daily, weekly, monthly, etc.). The transparent overlay is then changed and hazards are drawn on the other layers, such as the location of SHAs and unexploded ordnance, including all areas known to local people.

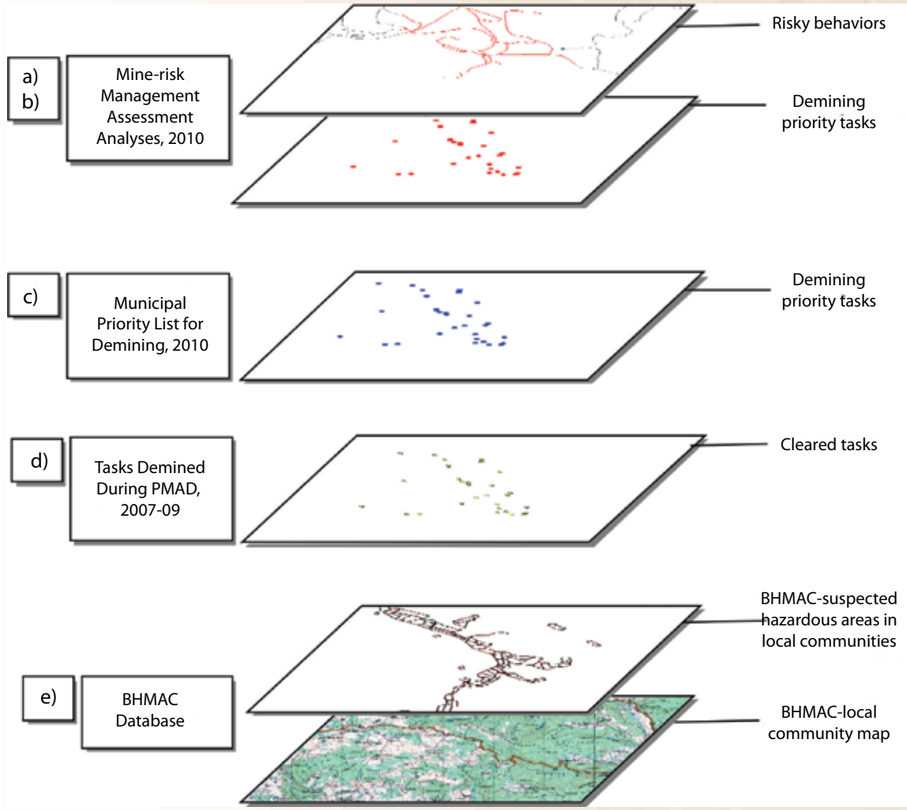

Figure 1. The MRMM process.

Since MRE aims to increase awareness about the dangers and risks of entering a SHA, most people will not readily admit to entering a SHA (even under economic necessity). Few people want to admit to taking these risks and facing the stigma of being foolhardy as well as desperately poor. However, by soliciting information about both activities and hazards, the MMRM allows for more detailed and possibly more honest responses from the local population.

The photos depict examples the overlays for one location were drawn. The layers in this case are as follows:

1. Infrastructure and meeting places (black)
2. Key agricultural land (green)
3. Water sources (blue)
4. Paths hunters use (purple)
5. Areas local people consider to be hazardous (red)
6. Areas already cleared (blue)

Even if the underlying map is not completely accurate, the same map is used for each of the overlays (see Figure 1 above).

Analyzing the Results

Once the maps are drawn, combining the transparent layers is done by laying them on top of each other. Holding them up to a light source allows the user to see through several layers at once. It is immediately obvious where human activities and hazards intersect, and which groups or livelihoods within the community are most affected. This information can be compared with official data, and then further used to pinpoint SHAs and prioritize clearance.

The real breakthrough happens when a group of people, both locals and experts, discuss details of the map together. Putting location data into words can

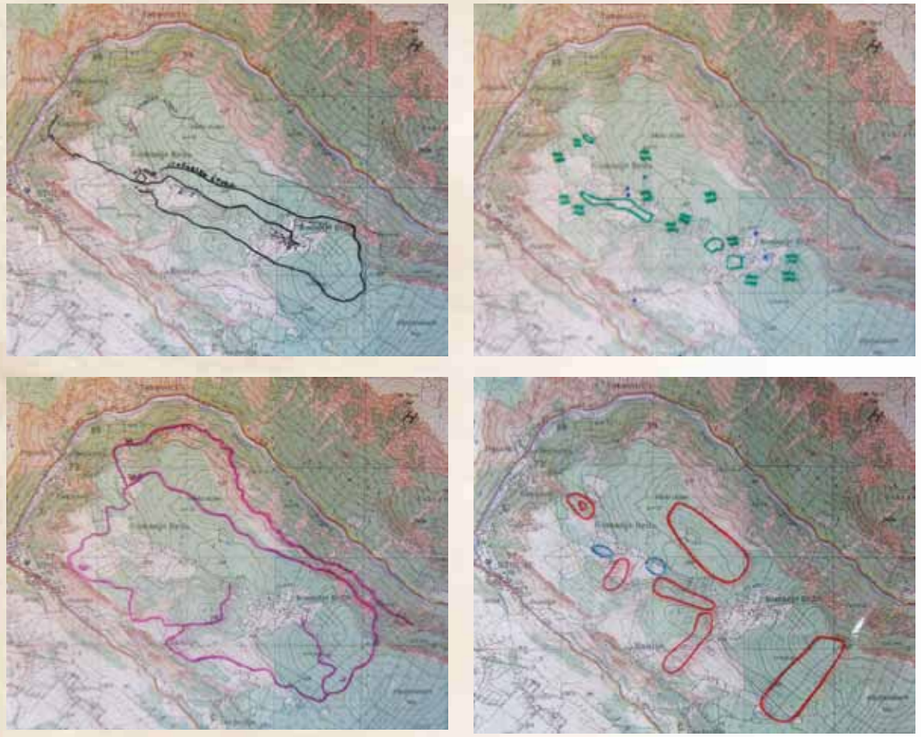

Image 1 (top left). Infrastructure and meeting places (black).
Image 2 (top right). Key agricultural land (green) and water sources (blue).
Image 3 (bottom left). Paths used by hunters (purple).
Image 4. (bottom right). Areas local people consider to be hazardous (red) and areas already cleared (blue).

be difficult and often makes people uncomfortable. In a post-war community where inter-communal relations are still sensitive, writing and signing a document that will be handed over to the local or national authorities is often perceived as a threatening activity. However, standing around a map and drawing lines and areas on an overlay usually starts a free-flow of information and opinions. This exchange can include controversial or sensitive information, including areas officially mined but considered safe by locals, areas where unofficial and unauthorized mine clearance has taken place, or areas that contain mines despite being officially considered safe. These areas need further verification by a Technical Survey process and the resulting status of each area should be publicized to the local people.

In BiH we found that the people quickly became engaged in the process after a few minutes of explanation. The images above are the result of the MRMM process in BiH. Simply defining the problem does not resolve the issue, but it does provide a firm foundation for the next steps.

Prioritizing the Clearance

By identifying the economic activities leading to high-risk behavior, development organizations have information regarding best practices to help locals reduce risk and survive the long wait for clearance completion. This is instrumental in the process of linking mine action and development.

In terms of planning and implementing clearance, the next step is to use the MRMM together with information from the national mine-action center, the municipality, and other analyses to produce a demining-prioritization map that can be used to create a demining task list. The process uses the same conceptual model of a multi-layer map and can be easily implemented on a widely used and well-known GIS, such as MapInfo® or ArcView. The diagram shows how the prioritization stage brings the information together. When used correctly, this is an example of the multi-layer method, effectively combining a variety of information into a single coherent view.

Dragan Okuka (on left), Mine-risk-education certified member of the hunter's organization "Prepelica," with people of the village of Pocrnje, Municipality Berković, Bosnia and Herzegovina, during the risk-mapping process.
All graphics courtesy of Goran Knežević.

Clear, objective criteria can be established by the mine-action center in consultation with local communities before the MRMM process begins to prioritize which areas should be cleared first. For example, a SHA located near a path used by children, or an area of land in a SHA that is needed for more than one essential activity (e.g., grazing land with a water source) could be determined to be a top clearance priority. Local needs affect this prioritization, taking into account inputs from technical demining experts, development specialists and above all, locals. If this is done before the mapping exercise, subjective views about importance and, in some areas, local influence or favoritism can be reduced. The map overlays will show where the high-priority activities are taking place in an unequivocal and objective way.

Summary

MRMM provides a useful method for attaining SHA information from the local populace. The process relies heavily upon the locals' ability to grasp the concept of a map; however, trials conducted in Colombia and particularly in BiH were highly successful. Identifying local activities within SHAs facilitates a risk analysis, significantly improving the success of clearance prioritization. With this data, ERW-affected areas are easily identified through methods compatible with standard GIS systems, providing essential information to those tasked with discerning clearance priorities.

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