Information Systems for Mine Action from the Data Entry Point of View

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Information Systems for Mine Action from the Data Entry Point of View

This article aims to provide readers with a closer insight into the endeavors of creating an information system and problems related with keeping data consistent and up to date, especially from the point of data entry. The author strives to provide honest and direct insight into the problems and solutions found while supporting mine action activities in Bosnia and Herzegovina.

by Zoran Grujic, Assistant Director of Information, Bosnia & Herzegovina Mine Action Center

Chronology
Mine action in Bosnia and Herzegovina started in March 1996. The basic task was the obligation of former warring factions to submit all minefields reports and clear all of the minefields within their area of responsibility. Wanting to sort out the mine problem and being aware of a lack of expertise and technical resources, the University of Belgrade and UNMAG, issued an appeal to the international community in January 1996 to provide help and kick-start the program. As a result, the first set of equipment and the first teams of foreign experts came to Bosnia in March 1996, and their first task was to set up a database capable of dealing with the mine problem in Bosnia and Herzegovina. The initial database system was developed by the FGM Company, and it was set up and running as of July 1996. The first set of data was given to the United Nations Mine Action Center (UNMAC) by the Implementation Forces for the Dayton peace agreement (IFOR). At this time, humanitarian standards were not created and a favored approach was mine lifting.

After July 1996, all the assets were submitted to the Bosnia and Herzegovina government. From the database points of view, that meant data entry was to be decentralized to the Entity mine action centers (MACs), and more than that. Entities MACs were responsible for reporting to their governments and the donor countries. The UNMAC had a centralized structure that lasted until July 1998. From that time on, in February 2001, we had a tripartite structure composed of the MAC for the Federation of Bosnia and Herzegovina, the MAC of Republika Srpska, and the Bosnian and Herzegovina MAC (BHMAC) at the state level, which has the task of coordinating activities between Entity MACs and maintaining central activities like standards, accreditation and databases.

Time proved that there was a need to centralize some functions. As a first step, it was necessary to create some sort of "umbrella" for MACs to work under. As a reaction to that need, the Ministry of Civil Affairs and Communications was chosen in September 2000 to change activities on behalf of the Bosnia and Herzegovina government. The Board of Directors was made necessary by the international community. A new Demining Commission was appointed as a part of the Ministry of Civil Affairs and Communications.

Knowledge gained by that time also proved that an entirely new structure was needed. Part of these thoughts are included in the Bosnia and Herzegovina denmitting law. As a result, the following has happened:

- **February 2002**: Demining Law for Bosnia and Herzegovina put in power versus Bosnia and Herzegovina or one even smaller.

Once the database system is in place and running, the next task is to link the MAC with entities. Thus far, this has not been possible because of some people to talk and exchange information with. Based on our experience, it was very easy to organize meetings, less easy to give some sort of understanding and even less easy to exchange information. In recent situations, the situation has changed, but not significantly.

Because of the fact that wrong entries made at the initial phase very rarely get rectified, it is never enough to emphasize the importance of the initial data entry, since it sets up ground for further mistakes. Reasons may vary—underestimating, increased amount of work or sometimes pure laziness.

**If Possible, the Mistake Will Be Made**

The most common mistakes in my experience are figures mismatched while entering coordinates, like entering BP 345345 instead of BP 345345. The error is harder to find as we go right toward smaller units. The only possibility to avoid this is some sort of automated data entry for coordinates, which has become possible only recently by the provision of the differential Global Positioning System (GPS) for field work. Additional problems could be described as:

- Using any comment field for all of those things that should have been entered elsewhere.
- Tampering with tables without sufficient knowledge on data structure by applying the "Data create-a-report-by-myself" approach.
- Deleting records.

One possible way of rectifying the mistakes is to conduct a survey to conduct significant field activity, with very little impact to final data quality. For instance, in the territory of the Federation of Bosnia and Herzegovina, a "Systematic Survey" took place. The idea was to talk with all municipal authorities and to make them express their concerns on mine contamination, and to gather information on confrontation zones and possible risk areas (together with some sort of prioritization for these areas). After one year of activities, the final result had less then three persons of minefield records in the proper places.

**Basics of the System**

While creating an information system for mine action, some decisions need to be made about the database engine and the Geographic Information System (GIS) software. For the Bosnia and Herzegovina system, these decisions were made at the very beginning by the FGM Company giving us MapInfo 6.0 as a GIS and Paradigm 7.9 as a database engine. Later on, although several other software products were on the market, we decided that this was the right tool for our team should remain intact, and today we are running our system on Paradigm 9.0 and MapInfo 6.0. In order to avoid problems with different geometry parameters (projection and ellipsoid), we decided to use an intermediate solution, La/Long and WGS84. We also decided to split data by keeping descriptive data with the database engine and keeping spatial data linked to their descriptions within the GIS part of the information systems.

Vector data are being processed by use of an exported .dbf file having vector data input finalized by the use of the drawing tools. This rather odd solution was chosen to give the data entry personnel the ability to check all coordinates again once prior to entering the shape into the database.

Regarding raster data, after several tries with Defense Mapping Agency (DMA) (Natural Imagery and Mapping Agency (NIMA) maps), satellite images and a variety of other sources, we came to the conclusion that maps used by war-torn factions during the conflict are the best possible backup. For internal minefield data entry and planning, for available reason for this is the easy identification of the reference points taken from them at the time of the report creation.

Because of their accuracy, cadastral maps are the best for reporting on humanitarian demining activities in our experience.

Raster data in use by the Bosnia and Herzegovina mine action system for mine action are as follows:

<table>
<thead>
<tr>
<th>Scanned and registered</th>
<th>satellite images for the scale are available</th>
<th>Scanned and registered</th>
<th>Scanned and registered</th>
<th>Satellite image for region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1,000,000</td>
<td></td>
<td>1:300,000</td>
<td>1:200,000</td>
<td>1:100,000</td>
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<tr>
<td>1:50,000</td>
<td>50%</td>
<td>1:25,000</td>
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<td>25%</td>
</tr>
</tbody>
</table>

In order to improve the accuracy of the reporting, GIS is in use (less 20 cm accuracy).

**Once You Have It**

One way or another, the information system will most likely be the first visible part of any MAC; thus, all the training will be done according to the information system in use. Since we are dealing with mine contamination in countries that have just finished a war, it is unlikely that one can be in a situation where all preconditions are already fulfilled. Initially, the training will be provided to further inform department staff members and later on hopefully propagated through a kind of help desk provided to the rest of the staff. Being the first department up and running, and being attractive because of its results, this becomes the most exposed department and takes significant role in PR activities.

Looking at things from the other perspective, all possible errors that will occur while prioritizing or making peripheral reports, any kind of propaganda, or any fundraising materials will be automatically non-existent if one finds some sort of wrong data provided by the database, making them perfect victims for all other errors.

My experience says that besides lack of existing documents, all possible errors that will occur while prioritizing or making peripheral reports, any kind of propaganda, or any fundraising materials will be automatics non-existent if one finds some sort of wrong data provided by the database, making them perfect victims for all other errors.

Administrative errors and errors of bad faith are those who have been entering data input finalized by the use of the drawing tools. This rather odd solution was chosen to give the data entry personnel the ability to check all coordinates again once prior to entering the shape into the database.

Regarding raster data, after several tries with Defense Mapping Agency (DMA) (Natural Imagery and Mapping Agency (NIMA) maps), satellite images and a variety of other sources, we came to the conclusion that maps used by war-torn factions during the conflict are the best possible backup. For internal minefield data entry and planning, for available reason for this is the easy identification of the reference points taken from them at the time of the report creation.
The only way to sort out the problem was to create the law that will force information flow and get the system running.

Need to Have

So what could be a solution to have an information system and have data entered into it? First, an absolute necessity is to have clear, well-defined procedures providing as much data as possible and, if possible, have it organized in such a way that they can be entered into an information system with a lot of predefined values. In order to emphasize the importance of certain fields, it is advisable to have some fields that must be entered as a condition to proceed.

Another problem is how to keep the entire operation maintained. Our experience shows that there are two solutions either not delete records (just declare them canceled) or have well-formed and carefully programmed routines for record deletion. Over time and with the expansion of activities, it becomes obvious that some sort of redundancy has to be implemented, and ideally, there should be a printed journal file (log book for major changes).

A need to have a chance to educate and re-educate staff is more related to program managers, as they often forget the simple fact that one may gain knowledge not only through trial and error, but also by attending seminars. This is not only more cost-effective, but it also creates a sense of importance for the staff and in the long run creates a better environment and more effective employees.

Besides the problems mentioned so far, there are also some points that simply cannot be over looked. When the staff moves, things are forgotten. Being (at least in Bosnia) the first organization in place maintaining a live database, the staff educated during the process become an asset desired by other companies. By rule, salaries reflect funding, and it is difficult to keep quality staff together.

Another problem is purely physical: paper copies are inclined to disappear or get lost by manipulation. With lack (from the program's point of view), the amount of activities is growing and the paper archive is growing, which means more data to enter. A solution would be to scan all the reports and to use the scanned images as information carriers.

Priority and the Information System

It is not always easy to find a mathematical algorithm to define priorities. Sometimes even scoring does not help, for instance, the complicated state structure reflects procedures for priority definition. Also, the term "impact" can be understood in many different ways. Speaking of complexity, here is a Bosnia and Herzegovina state structure equation:

State + Entities = 3

Districts = 14 Governments

Taking into consideration the fact that real executive authority lies in municipalities (more than 1,200), it becomes obvious why priorities cannot be defined based just on some "points."

Through six years of data collection, we learned that where the mines are and the real impact of them on the population and society is the question. The problem is that priorities have to reflect needs and be part of plans for development as desired by authorities. Otherwise it's simply not working.

Southeastern Europe Approach

In order to have a broader scope and to share experience with neighboring countries, we used an opportunity kindly provided by the European Commission (EC) to start a project on regional data sharing. So far, the beneficiaries of the project are the following countries in southeastern Europe (SEE) region: Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro, Albania, Macedonia, and Austria— and this list is likely to expand.

So far, we have sent four experts to the Joint Research Center and information interchange has proven possible. Based on data inconsistency, it becomes obvious that some sort of standardization has to take place. Thus, we agreed on standard hardware and software packages. In order to be able to show data for the region on a single map, we agreed on basics for use of the satellite images, and we have images provided for the region.

Prior to the information interchange, we had a four-day meeting in Sarajevo yielding some information interchange core standards for SEE. Based on experience gained through these activities, exported data sent could be harmonized. Once a standard for information interchange is provided, information can be interchanged. An exporting effort helps a lot because some of the mistakes became visible. A "house cleaning" was necessary. More than that, countries within the region are helping each other solve problems. A good illustration of this is the BHMAC's GPS campaign in Albania.

Since all participants provided data without any problems, SEE could be used as an example of diversity in impact. In fact, the term "one-size-does-not-fit-all" problematic condition is accepted, it was considerably easy to achieve awareness on information-sharing benefits.

Having seen all aspects of information sharing and cooperation, I think it is time for the Global Information Exchange Standard for mine action. We fully support the Mine Action Enabling Markup Language (mXML) initiative, which becomes more and more accepted as a standard protocol for information interchange.

Endnotes

1. Results of the conference can be seen at http://www.bhmac.org/BHMAC/info/conferences/conference_e.htm

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International Board of Donors. Mr. Rowe moved to Bosnia during the war and has been involved in Bosnian mine action since the beginning. He has survived the BHMAC's progression from mine action side-show to center-stage attraction.

To appreciate the turnaround now taking place, some background is necessary. Mr. Rowe describes the mine threat left by the war as "quite complex because of its extent, because of its low density and because of its random nature," making "the landmine problem here less quantifiable than in other parts of the world."

Knowing refugees and internally displaced persons (IDPs) would soon try returning home, the United Nations set up a mine action center in 1996. The international community decided that Bosnians should run their own mine action program, handing over all responsibilities on July 1, 1998. The Bosnians inherited a structure that was "a development program in a 100 percent task-oriented environment... a decision perhaps more designed to accommodate political needs than immediate practical post-war considerations," says Mr. Rowe. Under that structure, the State-level BHMAC was essentially subcontracted to the two relatively autonomous Entity MACs (one representing the Federation of Bosnia-Herzegovina and one for the Republic of Srpska), effectively preventing it from wading any real managerial influence over demining operations. Many in Bosnia feel that the United Nations funded the program over to Bosnian authorities a bit too early, before either the MAC or the Bosnian government was ready.

By late 2000, a budget crisis created and exacerbated by allegations of corruption and mismanagement at the highest levels.

The BHMAC: A New Law, New Structure and New Hope in Bosnia

After years of struggling with an inefficient mine action structure, a new demining law has reformed the Bosnia-Herzegovina Mine Action Center (BHMAC). Bosnians finally have the means to conquer their landmine troubles.

by JJ Scott, MAIC

Introduction

A new law enacted in March of 2002 marked the beginning of Bosnian mine action renaissance that will improve everything from national program management to individual minefield procedures. A complete restructuring and reorganization of the Bosnia-Herzegovina Mine Action Center (BHMAC) will finally allow the "head" of Bosnian mine action to effectively direct the bodies beneath it, and to responsibly report to the government through the Demining Commission. The Bosnian government formulated the demining law and will help fund its implementation—an extraordinary step toward its goal of effective national program ownership.

The new law and the structures it creates finally give Bosnian mine action practitioners a management system that is attuned to their own culture and unique landmine situation—indestructible weapons in the struggle to free their nation from the landmines holding it hostage.

History/War

Over three years of fighting (1992–1995) among several different armies, Bosnia has been engulfed in a war that will not end until the ghosts of the past are finally laid to rest. It was the war that left behind a legacy of destruction and suffering, and the wreckage of a once promising modern nation.

In 1992, an estimated 100,000 to 120,000 landmines were planted on the field of battle, with at least an additional 30,000 mines having been planted in the north and west. The majority of mines were planted to deny territory to the opposing army and to maintain control over a region. The result was a landmine contaminated environment that effectively prevented any organized military from attacking or defending their positions.

Landmine contamination was the primary cause of many civilian deaths and injuries, as well as the destruction of crops and other forms of agriculture. The result was massive economic losses, which further contributed to the overall economic collapse of the region. The landmine problem in Bosnia-Herzegovina is estimated to be between 500,000 and 1 million tons, with a density ranging from 3 to 5 mines per square meter.

The BHMAC track behinds the BHMAC headquarters, beside the Marshal Tito barracks.