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The Mine Action Process

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Features

The Mine Action Process

by James P. Trevelyan, Associate Professor
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Introduction

There are three ways to improve the mine action process to allow displaced people to return to their land sooner and with less risk of injury. Naturally, a major increase in aid funding would achieve a similar result using the existing process. Three main avenues to achieve improved outcomes with the same level of funding are as follows:

- Improving the technology, cost effectiveness and reliability of the mine clearance process,
- Applying risk management approaches to manage mine contamination problems, and
- Utilizing local resources and seeking alternative sources of funding more effectively.

Recent Improvements

The improvement process is not static. Deminers are constantly seeking improvements within the limited resources available, resulting in significant cost-effective improvements in the last few years. For example, in southern Africa, mine detection dogs working with explosive vapor sampling filters, mine resistant vehicles with steel wheels and other innovations have significantly improved road clearance rates. Flail machines have sped up vegetation clearance. In Bosnia-Herzegovina and Croatia, vegetation clearance machines combined with mine detection dogs and manual deminers have significantly reduced clearance costs per square meter. In Iraq and Afghanistan mine detection dogs have improved performance, increasing the land cleared with the same resource input. Safety improvements in Afghanistan have reduced demining accidents tremendously.

In Afghanistan, general-purpose machines like backhoes have sped up work in difficult demining conditions. The concept of "mechanical assistance in demining" has emerged. The emphasis has moved from machines specifically designed to clear and neutralize landmines to the use of machines in support of manual deminers. In Cambodia, the introduction of metal detectors, effective in mineralized ground conditions, has alleviated performance problems with metal detectors.

The deminer's level of comfort has also been addressed. Lightweight, comfortable cost-efficient protective equipment and improved hand tools are now manufactured in several mine-affected regions, such as Zimbabwe, Pakistan and Cambodia.

The number of countries requesting clearance assistance has increased, resulting in limited country donations. Major mine problems have emerged in the Middle East, the Caucasus, Africa and the Americas, suggesting the improvement rate has been insufficient, and requiring advances to significantly progress in the next decade.

Road Blocks Impeding Progress

Demining technology needs to be improved, but improved technology alone is not sufficient. Without noted improvements in program management, performance improvements from new technologies may never be realized. Human resources in program management are used ineffectively and spread too thinly. For example, flails were introduced in Afghanistan several years ago, but there was insufficient management expertise to ensure that they were used appropriately. The same problem will recur with new technologies if we do not address management issues simultaneously.

Another roadblock is the lack of transparency in funding arrangements. The normally quoted cost of demining in Cambodia does not include the expense of foreign technical advisers. Technical advisers are usually supplied at no direct cost to a demining program. Typically, the cost is covered by internal transfers within governments (aid budgets). Equipment donations, particularly large machines, also help to obscure real funding levels. Sometimes, machines are leased, on a temporary loan or gifts to NGOs. This practice makes comparisons of real costs and performance levels difficult. To progress, we must make valid comparisons between different approaches. While technical performance is often difficult to measure, financial performance can be even more difficult. We must measure both.

Finally, a lack of intellectual precision in mine action leads to unnecessary debate, poor decision-making, slow technological progress and resource wasting. Recently, considerable time and energy was spent on the discussion of a new proposal for a demining quality standard based on the concept of Acceptable Quality Level (AQL) the number of mines remaining after clearance per sq. m (GICHD 2000). According to sources, the level proposed was higher than the density of mines in most Afghanistan mine fields prior to clearance. With the benefit of hindsight, a valuable lesson is learned—it demonstrates that comprehension of humanitarian demining issues requires widespread improvement. The fact that this discussion occurred among leading experts in the field demonstrates a serious lack of intellectual support.

Many research groups focus on the mine detection problem; however, the number of research groups who focus on the broader aspects of humanitarian demining are few. There is no peer review journal the JMU's *Journal of Mine Action*^[1] is useful, but most of the content appears to be anecdotal. More care with intellectual precision will replace opinions with evidence, anecdotes with data and arguments with analysis. This transfer, in turn, will provide a reliable foundation to base decisions and to evaluate outcomes.

Technology Needs

We conducted a study of demining technology needs in several countries in 1999, and the full results are on our website and available as a CD-ROM (Trevelyan 2000). The study was conducted by a systematic qualitative approach based on contemporary needs studies in the social sciences.

Aim of the Study

The U.S. Army Night Vision and Electronic Sensors Directorate at Fort Belvoir, Virginia, commissioned the study to provide a database of demining technology needs, prioritized where possible, and presented on a country-by-country basis.

Technology Needs of Deminers

Mechanical and tool technologies would measurably improve safety, quality or cost-effectiveness without compromising other factors. This grouping includes known and available technologies and those in need of further research and/or development.

Summary of Results

The most urgent technology needs expressed by the demining community are:

- **Mechanization:** Deminers need mine-resistant vegetation cutting machinery and other multi-purpose machinery that can be adapted for demining and other construction tasks. They prefer versatile machines. Much of this machinery is currently available from commercial suppliers with some (mostly minor) modifications. Magnets can reduce later work by manual deminers by collecting surface metal fragmentation. Significant cost reductions and production rate improvements are achievable with more mechanization.
- **Mine detection dog performance indicators:** Deminers are concerned that mine detecting dogs are unreliable due to insufficient scientific testing. A major international study has been commenced under the leadership of the Geneva

International Center for Humanitarian Demining (GICHD), but more resources are needed.

- Deminers often prefer detectors that can distinguish mines from metal fragments, either by sensing explosive or other aspects of mines. The high false alarm rate from metal detectors and probing is a major cost factor.
- Quality control techniques: Quality control is a major issue in many demining programs, perhaps causing more arguments than any other issue. The existing quality standard needs to be reviewed and replaced with more practical alternatives. More cost-effective quality control sensing technologies are also needed.
- Better protective equipment: While well designed equipment exists, more comfortable protection from high velocity fragments is needed in some regions.
- Less obvious needs, such as high quality drinking water, better uniform materials and better hand tools are relatively easy to satisfy and could, when combined, lead to significant performance improvements.
- Information technology: Deminers need better Internet access, mapping software and better data collection and distribution between central databases and field offices. Aerial photography could help deminers in several countries, but its potential is only just beginning to be appreciated.
- Vegetation: Excessive vegetation is a major problem in several countries. While machinery can help, in the long-term, the cost to clear vegetation with special vehicles prior to mine checks is prohibitive. Methods to localize explosive contaminants could reduce environmental remediation costs in many regions, particularly the Balkans, Africa, Central and South America, South Asia and Southeast Asia. Faster release of uncontaminated land can bring major economic benefits.
- Deminers expressed special operational needs, such as clearing mine-contaminated rubble from buildings in Afghanistan, clearing mines washed into rivers in floods and deeply buried mines and mines laid in mud flats or swamps, which men and machines cannot access.

Training Needs

Training needs in the mine action community have been well documented in recent U.N. reports. Surprisingly, the emphasis in training is directed at the small number of expatriate management staff. Training is required at all levels of demining organizations. While there is support for training field deminers with "train the trainer" schemes, management training at middle levels of organizations for national staff is needed. Between 25 percent and 40 percent of local staff, including deminers who are likely to be promoted to section leaders, require training in the following:

- Contract administration and management
- Quality management
- Accounting and finance
- Organizational behavior
- Communications and interpersonal skills (written and spoken)
- Language skills (regional languages and English)
- Demining technologies
- Effective use of machinery and other capital equipment
- Performance measurement and monitoring
- Occupational health and safety
- Socio-economic evaluation techniques
- Geographic information systems
- Management information systems

This investment in human resources increases the mobility of local staff. International demining agencies have recruited a number of middle management and senior

management staff from Afghan Technical Consultants (ATC) who are now working in other countries. While this turnover increases the local training need, it still represents an effective investment in the international demining effort. Furthermore, the management skills that people learn represent an investment in the future of their country, which is equal to clearance skills.

Suggested Options for a Response

A coordinated response from the donor community is needed. Contributing to the reason these needs have not been satisfied is a lack of understanding of the real problems facing deminers. Aid donors and, in some instances, demining program managers, are not fully aware of their needs. Many of the technology needs can be satisfied with moderately priced equipment. Donor institutions could increase resource effectiveness by ensuring that these needs are satisfied. These needs include the following:

- **Mechanization:** Machines and appropriately equipped support organizations could significantly improve the cost effectiveness of several demining operations in a short period of time.
- **Mine detection dogs:** When properly used, dogs could improve the effectiveness of several mine clearance programs. Urgent research is needed to resolve apparent performance problems with mine detection dogs in several countries.
- **Commercially available improved protective equipment** could reduce deminers' injuries.
- **High quality hand tools, high quality drinking water supplies and more attention to details, such as uniform materials, to improve deminer comfort** could yield significant performance improvements at modest cost. Given that each deminer costs about \$10,000 a year to support in the field (salary, equipment, supervision, training, logistics, etc.) in Third World countries, and up to \$50,000 or more in Europe, a 10 percent performance improvement could save about \$5,000 annually for each deminer.
- **Information technology improvements** could also bring significant cost savings through better resource allocation.

Improving the Technology by Buying Equipment

Capital equipment for demining programs seems to be on an ad hoc basis. The Mine Action Program of Afghanistan (MAPA) has requested donor support for more backhoes for several years. Recently, a Japanese company persuaded the Japanese government to offer one of its specialized demining machines to MAPA. This new machine has not been tested in mine field operations. After lengthy negotiations to secure an adequate level of ongoing support, the offer was finally accepted. Support for additional backhoes, which have a proven record of performance, is still not forthcoming.

Our survey of technology needs showed that general-purpose and vegetation clearance machinery would provide short-term benefits in nearly every mine clearance program. Donors must consider a coordinated investment program in machinery. While this investment cannot be justified individually, it can yield significant cost savings for all donors in the short term. By approaching such an investment program internationally, it may be possible to reduce individual companies' influence and emphasize the operational needs of demining agencies more.

Improving Technology by Research and Development

Other technology needs require further research and development. The U.S. sponsored "2010 Initiative" (U.S. Department of State 1998) aims to mobilize about \$1,000,000,000 yearly for landmine eradication. The research and development necessary to satisfy most of the outstanding needs of deminers could be completed with approximately \$30,000,000 yearly. However, most of the current research funding (perhaps \$300,000,000 annually) is not being used effectively to solve demining problems.

The major part of the research effort is directed at high technology detectors, both vehicle

mounted and manually portable. This research aims to satisfy the need for detectors able to distinguish mines from the metal fragments. Started in the early 1990s, this effort has yet to yield any useful improvements.

A relatively small research budget, better directed, could have a more efficient impact if it pursues the following objectives:

- Find ways of measuring and predicting the performance of mine detection dogs.
- Develop effective quality measurement and assurance methods (Appendix 2).
- Find ways to survey and map mine/UXO contamination without the need for men or machines to enter the affected land. Promising methods include extending current air sampling methods where dogs sniff the samples and the use of bacteria to indicate localized explosive traces in the environment. Aerial photography also shows some promise where vegetation is thin.
- Resolve special operational needs, such as clearance measures for mud flats, rivers and sandy areas, residential areas in Afghanistan, deeply buried mines in marshes and salt lakes, etc.
- Refocus research of detection technology at the problem of reducing the false alarm rate, rather than eliminating false alarms.

If successful and employed, these efforts would provide major cost effective improvements in mine/UXO clearance.

Allocating 15 Percent of Funds For Process Improvement

Demining program managers find process improvement difficult because they lack support resources. Funding agencies refuse additional funds for experimentation and development activities. Improving the process requires significant investments from donors for cost effective improvements.

It is common for industries involved in significant technological improvement to spend 10 to 15 percent of their turnover on research and development activities and staff development. This level of support is essential to improve demining processes. To encourage this support, donors should allocate 15 percent of project funding specifically for overall process improvement and human resource development (training). It may be impossible to directly measure the degree of improvement achieved by such an initiative within the time scale of typical projects. This level of funding must be committed as an investment for the longer term. Process improvement activities require the following:

- Training programs to improve communication skills, technical competence, language skills, resource scheduling skills and the ability to operate in a large organization.
- Development of local operations' research capabilities using national staff with sufficient funding to attract former nationals with research training.
- Technology research and development specifically directed at humanitarian demining issues and performed in collaboration with operational demining organizations. Funding for this activity could be pooled internationally and allocated on the advice of deminers and researchers together.

Supporting Research on Risk Management for Mine Contaminated Land

Several countries contain large areas of land with unknown or limited levels of mine contamination. In Croatia, estimates range from 6,000 sq. km to 10,000 sq. km of contaminated land, but the contamination density over most of that land is low in terms of devices per sq. m. In Bosnia-Herzegovina, a large proportion of civilian mine accidents occur in unknown mine-contaminated areas. In Lebanon, there are large areas of land with unknown levels of contamination with more civilian casualties than in Croatia or Bosnia-Herzegovina.

There is no foreseeable technology for economic clearance of these large areas of land. With present techniques, there may never be sufficient resources to remove the

contaminants completely. Governments facing this problem need risk management tools to use the land effectively. There has been little published work and limited research in this area. A recent paper on risk management techniques in demining (Brown 1999) advocated the use of machinery as a risk reduction tool. While these suggestions are useful, we can make little progress without extensive data and useful statistical models.

Researchers in Lebanon have conducted epidemiological studies of affected civilian populations. They have collected data that links land use, activities, population groups and the risk of accidents (Aoun 1999). To use this data, we need statistical methods to measure the extent of mine contamination in the inhabited areas. At the moment, no such data exists and there are no methods to collect this data other than the expensive alternative of complete clearance of the affected land. While complete clearance is obviously desirable, the future prospect of sufficient resources for this task is not viable. We need research on risk management, mine contamination measurement and epidemiological studies of populations at risk.

While there has been little research on risk management, there are well established technologies which could help people to coexist with mine contamination. Mine resistant vehicles have been in use in southern Africa since the 1950s. Recent research has established low-cost methods for manufacturing protective equipment for deminers, which could be extended to provide protection for people working in areas affected by landmines. We have only just begun to accumulate tools and technologies for people to live with mine contamination. This task is important because these techniques offer a way for people to use land resources that would otherwise be denied to them for decades, if not centuries.

Support for Grant Application Process

MAP managers spend a significant proportion of their time seeking further program funding. As the sources of funding become more diverse and the arrangements for funding become more complex, this drain on management resources will worsen. The complex terms and conditions associated with project funding applications from donor governments require a high-level of expertise in writing applications. Applications to the Australian government have required detailed consideration of equity in gender participation in projects. In an environment such as Afghanistan, a high standard of creative writing is required to address such issues. Therefore, it is only reasonable that donor governments provide some support for the grant application process.

Staff capable of writing effective grant applications are extremely costly to employ in mine affected regions (about \$200,000 yearly). Given that many grant applications are unsuccessful, it is not unreasonable to expect that two to three percent of the program costs will be involved in fundraising. If donors need effective program management, they must provide separate resources for grant application processes.

Researching the Potential for Philanthropy and Micro Credit

Demining technology is only one of three areas where improvement is possible. Another avenue for significant improvement is to open up alternative financial services. The current sources of support for demining are as follows:

- International aid funds,
- In-kind support from international aid donors,
- Direct host government support and funding and
- Indirect host government funding and the use of military personnel in demining operations.

Most countries affected by landmines also have relatively weak political institutions and limited revenue from tax collections. They are often tightly constrained financially, and government employees are either unpaid or poorly paid. Weakness at the political level often means that the major part of the economy operates outside institutional and governmental controls, which limits state institutions' ability to participate in mine clearance activities. It also makes it difficult for international aid donors to contribute effectively. Donor states seeking "exit strategies" after a period of aid funding will be frustrated. State institutions will be unable to fill the gap. This problem does not mean that demining

programs cannot be supported using local finance—it means that we have to look for alternative sources at the local level.

There are two potential sources of funding. Even in the poorest regions, wealthy individuals and families exist. Many have resorted to illegal or quasi-legal means to protect their wealth and often place money in foreign financial institutions. Some of these wealthy families want to use their funds to benefit their communities. They need ways to contribute anonymously to avoid legal or political retribution. This need may be due to political differences between these individuals and families and those in control of the government.

The second source of funding comes from communities themselves. Micro-credit schemes have operated successfully in several countries, though they often require a high level of subsidy. Demining activities are relatively expensive compared to the economic return available from most of the land cleared, which makes it difficult to envisage a Micro-credit scheme not requiring subsidy. However, existing demining operations generally are completely subsidized. It therefore follows that any contribution raised through Micro-credit or similar schemes represents an improvement on the existing situation because the total funding for demining is increased. Furthermore, the implementation of Micro-credit schemes can significantly improve the level of financial skills in the communities affected, representing an investment in communities' futures.

It is time the international community addressed the resource input side of demining as a means of improving the process. We began this research about 12 months ago, and our results can only be described as preliminary. There is as much potential in developing alternative funding sources and funding models as there is in technological improvement.

If this improvement is to be realized, donor and mine action agencies must cooperate closely with major non-government actors and communities whose interests may differ markedly from government interests.

Conference Schedule

We could make much more effective use of our time with an agreed annual conference schedule. In the demining community, it is almost impossible to attend all conferences, given the number of conferences, committee meetings, working group meetings and workshops. Other international communities have developed annual conference schedules to avoid this problem. Events such as workshops and committee meetings are planned to coincide with major international conferences. The conferences themselves consist of several sub-conferences so that specialist groups can meet at the same time, rather than arranging separate meetings.

Scholarships

A cooperative approach to training is needed. While the burden of demining rests on local communities, research is often conducted by those in developed states. In order to rectify this imbalance in technical know-how and empower those directly involved in demining to make technological improvements, technical and research training programs need to be established. A program of scholarships for appropriately qualified national staff to attend universities would help to address the acute shortage of management and research skills in several mine-affected countries. The scholarships would carry an obligation to return to the mine action program for a minimum period so that the benefits are retained in the affected country.

Avoiding Short Term Contracts

It is essential to avoid short-term contracts and staff appointments. I recently asked one major demining company whether it conducted long-term follow up on its clearance projects. "How can we do that if we are no longer in the country?" it replied. "We only have a four-month contract." The appointment of technical advisers for a minimum period of 12 months, preferably 24 months, is also an issue with deminers. A deminer told us: "Some technical advisers with our program have been excellent. However, many technical advisers have come without any experience of demining and have only stayed long enough to find out that we know more than they do."

Given these opinions, we could argue that longer appointment periods will enable those unfamiliar with the situation to learn and then apply their knowledge and those already efficient in the techniques will be able to benefit the communities more. Local deminers will also be able to establish better working relationship with the “experts.” Social interactions are also important. Conveying knowledge in the absence of social interaction may not always be effective knowledge may be lost, misunderstood or cooperative learning may not take place.

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Appendix 1: Obtaining the Information on Technology Needs

The study was conducted by arranging country visits by at least one team member when possible. During each visit, team members discussed as many aspects of mine clearance as possible in the time available, and visited mine fields, mined areas and other parts of the country. A detailed report on each country describes these activities and what was learned.

The research was based on a combination of qualitative and quantitative analysis methods. In order to collect information systematically, team members followed an interview guide which was designed as a "survey instrument" using techniques currently used by social scientists. Since the aim of the study was to determine needs, many of which were not definable when the study started, the aim of the survey instrument was to allow interviewees to discuss the problems and challenges they encounter in demining with as little prompting as possible. The issues they raised were noted and explored further, if necessary. Naturally, some issues required more specific, quantitative data to be completely understood. Once issues had been defined, it was usually easy to collect the data needed.

The success of this technique is demonstrated by several completely new concepts that arose from the study. These concepts were not part of the demining "state of the art" when the study commenced.

Whenever it was feasible, the country reports were sent (in draft form) to relevant authorities to confirm their accuracy. Also, we had opportunities to discuss the draft report with several country representatives at a meeting of demining technology experts in Geneva in December. Several minor changes were made, and information on other countries (Chad and Nicaragua) was added.

In some instances, information was obtained from other experts who were familiar with countries we could not visit. These experts included:

Mr. Bill van Ree, Mine Action Consultant, former manager of MAPA, currently restructuring Cambodian Mine Action Center (CMAC).

Maj. Colin King, Mine and Explosive Ordnance Disposal expert and editor of *Jane's Mines and Mine Clearance*.

Mr. David Edwards, former program manager, U.N. Mine Action Program for Northern Iraq.

Each was interviewed using the survey instrument as a guide. All the detailed information in the country reports will be added to the web site once the relevant country authorities have confirmed the validity of the information.

Appendix 2: Why is Quality Measurement Important?

Measurement of quality performance lies at the heart of all quality management programs. Most texts on quality management assume the capability to measure quality. In typical industrial situations, quality can be measured using standard instruments. The process of obtaining measurements is usually taken for granted. In service industries quality is usually measured through questionnaires or simple time measurements, such as the time a customer waits to be serviced in a queue.

Quality improvement processes rely on measurement for evaluation. One cannot claim to have improved quality without being able to measure it with accuracy considerably smaller than the degree of improvement.

Without quality measurement it is difficult to compare the quality level from different sources of supply. This lies at the heart of demining debates in several countries: are the commercial operators cutting corners by working too fast? Are the NGOs wasting donor funds by working too slowly and cautiously? How much does demining quality depend on the degree of supervision? What is the quality variation between different demining teams?

In most industries commercial competition has yielded significant price reductions and performance improvements. Yet commercial competition in demining is seen by many as a retrograde step commercial competition and the profit motive are seen by these people as having no place in humanitarian demining. Their arguments have some validity, while there is no effective means of monitoring quality. However, with an effective quality measurement system in place, commercial competition is probably one of the best means of improving performance.

Deminers will make fewer mistakes if they receive immediate feedback. The quality measurement process introduced by Trevelyan (1999) provides an effective way of doing this. The more traditional approach using quality control inspections weeks or months after the original clearance operation is much less likely to be able to do this.

Appendix 3: Summary Table of Technology Needs by Country

(Presented as a separate table.)

