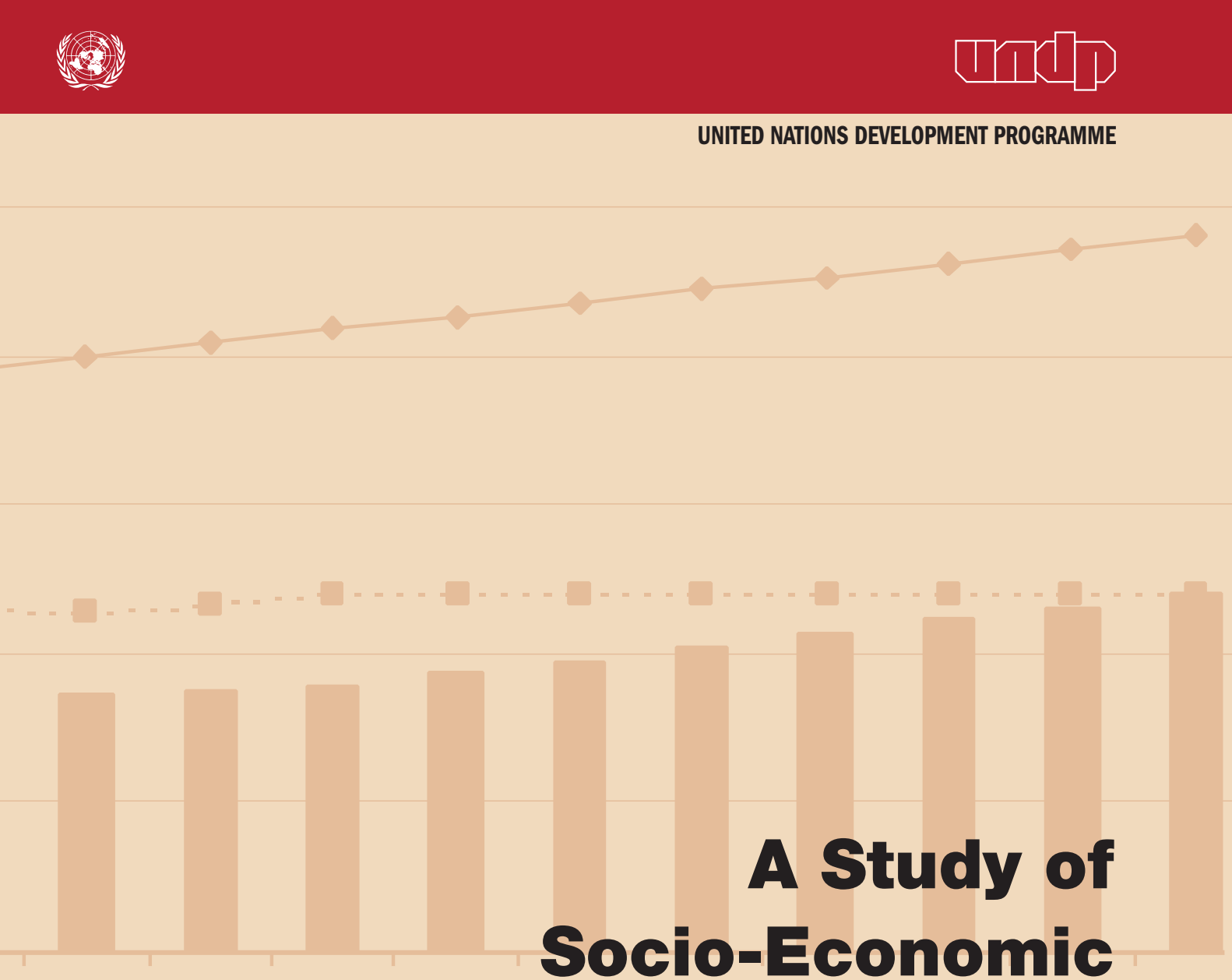

UNITED NATIONS DEVELOPMENT PROGRAMME

A Study of Socio-Economic Approaches to Mine Action

Geneva International Centre for Humanitarian Demining
Centre International de Déminage Humanitaire - Genève

United Nations Development Programme

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The **United Nations Development Programme** (UNDP) helps people in 174 countries and territories to help themselves, focusing on poverty eradication and democratic governance. In support of these goals, UNDP is frequently asked to help create and implement policies that are more responsive to the needs of ordinary people, and to help societies rebuild in the aftermath of war and humanitarian emergencies. UNDP is also an advocate for increased development assistance and a more inclusive global economy.

The **Geneva International Centre for Humanitarian Demining** (GICHD) supports the efforts of the international community in reducing the impact of mines and unexploded ordnance. The Centre is active in research, provides operational assistance and supports the implementation of the Mine Ban Treaty.

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Foreword

The dramatic increase in the number of armed conflicts over the past decade has halted, and often set back, social and economic development in many of the world's poorest countries. These confrontations have led to tragic losses of human life, large-scale population movements, destruction of physical assets and a severance of trade ties. For the survivors of the war, a culture of militarization and fear often remains long after the signing of peace agreements.

Reconstruction and reconciliation in these volatile circumstances are endeavours that require the full range of economic, social and political instruments of the international community. One of the first, and perhaps most fundamental steps is the restoration of a sense of security. In most situations, this means providing people with the ability to return to their communities, rebuild their homes, pursue their livelihoods and benefit from basic services, such as access to water and safe road networks.

This essential first phase of post-war development is often blocked by the presence of landmines. At a time when societies need to learn to live and work together, mines have the triple effect of shattering individual lives, increasing the medical burden on families and communities, and preventing States from developing land and rebuilding infrastructures.

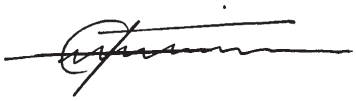
The United Nations system contributes to addressing the mine crisis through a humanitarian and developmental approach called "mine action". By articulating multi-faceted responses and providing co-ordination mechanisms, the United Nations aims to recreate an environment in which people can live safely, in which the needs of victims are addressed, and in which economic and social development can occur free from the constraints imposed by landmine contamination. The United Nations Development Programme (UNDP) is assisting countries with mine action in support of reconstruction and rehabilitation efforts in Asia, Africa and Eastern Europe.

The Geneva International Centre for Humanitarian Demining (GICHD) is active in research, provides operational assistance and supports the implementation of the Mine Ban Treaty. With a view to strengthening the effectiveness of the reponse to the tragic

and enduring problem of landmines and unexploded ordnance, UNDP contracted GICHD to manage a Study of Socio-Economic Approaches to Mine Action — to take a fresh look at how mine action activities are planned, managed and evaluated from a socio-economic perspective.

We would like to thank the following donors who provided the funding to enable the Study to be carried out: Canadian Department for Foreign Affairs and International Trade; German Ministry of Foreign Affairs; International Development Research Centre, Johannesburg; Survey Action Center, Washington DC; United Kingdom Department for International Development; United States Department of State; and the World Bank.

We hope that this Study will prove an important tool in strengthening the efforts of mine action to respond effectively and efficiently to the communities that must daily confront the deadly threat of landmines and unexploded ordnance.



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Study findings

Better managed mine action programmes

The various constituencies within the mine action community have made significant strides in grappling with mine action in a humanitarian or development setting. Mine action programmes have improved productivity, safety, quality assurance, and technical standards, and learned how to develop local capacities to assume responsibility for these aspects of mine action. Few organisations still focus on the numbers of landmines and unexploded ordnance (UXO) they have destroyed. Rather, they track and report the area and types of land cleared, reductions in accident rates, and the number of development projects assisted — all ***potentially*** useful outputs of mine action.

Many organisations are now trying to confirm systematically whether this potential has been realised in fact: for example, whether crops are planted on the cleared land and roads are being used; how many households are sustaining themselves on the cleared land — the desired social and economic outcomes. In some cases, organisations have conducted field audits to assess whether mine action has created unintended problems, such as poppy cultivation or the appropriation of cleared land by local élites, and whether corrective action is required. A number of organisations are experimenting with new approaches designed to address socio-economic problems and opportunities more directly. Handicap International's "proximity demining" initiative described in the Mozambique case study (*Appendix 3*) and the provincial planning process in the Lao People's Democratic Republic (PDR) (*Appendix 2*) are examples of this trend.

One area in which much further progress is required is financial transparency, including the introduction of proper cost/management accounting systems by implementing agencies and more complete reporting on the source and amount of donor funding. In some cases, it appears that official donor agencies may actively discourage the open publication of financial information.[1]

[1] More than 20 requests by the study team for very modest amounts of financial data from implementing organisations resulted in a total of two incomplete responses, with many organisations citing disclosure restrictions written into their funding agreements by donors.

On balance, however, the study finds that mine action programmes are becoming better managed and further progress can be expected for a significant period.

A more capable mine action community

This process of improvement has taken place within individual mine action programmes, but lessons learned in one locale are often adopted by the international mine action community. Diffusion is taking place as a growing cadre of experienced individuals moves from one to another programme, via the network of technical and expert working groups and, more recently, through tailor-made training programmes. Applied research is also contributing, with the United Nations *Study Report: The Development of Indigenous Mine Action Capacities* (Eaton et al., 1997) being an excellent example.

In addition, the international mine action community has developed a variety of common tools that allow new mine action programmes to "hit the ground running". These include a number of international standards and model Standing Operating Procedures (SOPs) employing the approaches developed in the quality management field. New generations of Geographic Information Systems (GIS), combining computer databases with graphic display and mapping systems, allow experienced users to create management information systems very quickly. As documented in the Kosovo case study (*Appendix 1*), mine action programmes often can deploy such systems in humanitarian emergencies well before similar tools are in place to support managers of other sectoral programmes. Finally, as described in Chapter 2 of this report, the Landmine Impact Survey provides a powerful tool to systematically document the impact of landmine and UXO contamination on all communities within a country, and to establish a preliminary ranking of priorities for technical surveys and mine awareness.

The evolution of priorities within programmes

It is both understandable and proper that mine action practitioners focused first on the "how to" issues, such as safety, quality assurance, and productivity. How many mines were destroyed? How large an area was completely cleared of mines? Did any accidents or breaches of safety procedures occur? The significant costs and risks involved, and the tragic consequences when errors or omissions occur, concentrate minds on ensuring the job is done right. Less attention was given initially to the "why" of mine action — i.e., is the right job being done? In part this was because the answer appeared obvious: mine action aims to reduce human suffering.

Most agree that the humanitarian imperative should prevail during periods when civilians are displaced by conflict and during re-migration in the immediate post-conflict period. Populations are most vulnerable at these points not only because risks are high, but also because refugees and returnees are uncertain about the location of contamination, and because they are destitute, with few reserves and limited options to risky behaviour.

The study found that the desire to prevent accidents continues to dominate task selection in most programmes well after the post-conflict phase ends. Risk

reduction generally prevails as the strategy of choice until the extent of contamination is well understood by the mine action programme, ideally through a comprehensive and systematic Landmine Impact Survey, which is intent on, in the words of the Survey Action Center, "arousing and informing human compassion".

Indeed, this humanitarian imperative will likely remain the principal motivating force behind the mine action movement, and a core objective of all mine action programmes. But how does one assess which mine action tasks will result in the greatest reduction of human suffering? Using Yemen as an example, Chapter 2 — *Impact of Mine Contamination* — describes the type of socio-economic analysis that may eventually allow us to answer such questions with greater assurance.[2] However, mine action also creates other opportunities: for land to be farmed, for goods to be transported, and for schools to be re-opened. How should one value such achievements and combine these with the deaths and injuries avoided for a complete accounting of benefits? How should the trade-offs between risk reduction and other socio-economic benefits change over time as a country progresses from war to sustained peace?

Socio-economic analysis comes into its own as the "why" of mine action — and the appropriate criteria to use in setting priorities — becomes less certain. What quickly becomes apparent in our study is that priorities vary with time and place. As countries recover from conflict, risks posed by landmine contamination abate[3] because (1) people learn what areas are contaminated, (2) people adapt to the risks, and (3) mine action programmes deal with the most egregious dangers. Focus begins to shift from immediate survival to sustaining livelihoods. People resume their normal social and economic activities. In countries with governments that seek to promote the well-being of their citizens, basic public services are resumed and a coherent development strategy begins to emerge.

The study found that the transition period from open conflict to sustained peace poses real challenges for mine action programmes. Risk reduction remains important but, as is apparent from the Mozambique and the Lao PDR case studies, pressure builds to consider other social and economic goals. Mine action programmes may be pulled in different directions by local governments, other agencies, donors, and the local communities themselves. There is no certainty that a clear picture will emerge how mine action fits into a coherent development strategy. Evidence from all three case studies suggests that, more often than not, the "senior" development actors — national governments, United Nations sectoral agencies, international financial institutions — consider mine contamination when it directly interferes with specific programmes and projects, but otherwise fail to incorporate mine action into their planning.[4] Without more guidance from other development actors, mine action organisations will have a difficult time ensuring that the outputs produced by mine action properly

[2] This focused on three concepts: pressure on resources, intensity of past conflict, and institutional endowment.
[3] The risks posed by UXO may not decline as rapidly, perhaps because UXO contamination is more diffused and because UXO is not so obvious a danger. These two factors may lead to familiarity, complacency, and risky behaviour.
[4] In current development parlance, mine action is not "mainstreamed" but remains an add-on.

support broader development objectives and, hence, achieve the desired social and economic results.

The example of Lao PDR and its recently-introduced annual work planning process does demonstrate that mine action can be better integrated into broader development planning, in this case at the district and provincial levels.[5] This may reflect that the conflict in Lao PDR ended almost a generation ago and the mine action programme — although itself fairly recent — operates in a "normal development" context.

Study findings support the view — albeit tentatively on the basis of limited evidence — that there will be a common progression in the objectives of a mine action programme as a country moves from conflict to normal development.[6] When a country remains in conflict and during the immediate post-conflict period, the overarching mine action objective will be to reduce human suffering by reducing accidents. Conversely, in a sound development environment,[7] the objectives of mine action programmes will be set by national authorities to advance the social and economic goals given in the country's development strategy and plan.

Unfortunately, less can be said with confidence about the transition period from post-conflict to normal development. First, a country's transition from war to sustained peace may be far from smooth, and there are many examples of regress. Second, there is no certainty that a developmental state — one that formulates development goals and implements programmes to achieve these —will take hold even if peace is sustained. Such a state is required to establish clear social and economic objectives that command general support and can guide mine action managers in their decisions. Third, there is no one best way through these transition periods. Even if all mine action programmes start with an overarching concern to reduce human suffering and end by adopting the social and economic goals set by host country authorities, the appropriate path from start to end will be determined in large part by the underlying social and economic features within each country.

Each country remains unique

One may theorise about general trends and common patterns across countries, but can say with certainty that each country remains in many ways unique in its principal social and economic features. Different socio-economic structures mean that different priorities should prevail in mine action programmes.

This is clearly demonstrated in Chapter 3 — *Socio-Economic Analysis of Mine Action*. The same analytic technique — cost-benefit analysis — yields significantly different results in Lao PDR and Mozambique. In the former case, our analysis

[5] Lao PDR is very decentralised in some ways. Still, the case study recommended additional measures to strengthen the link between provincial work plans and the national development strategy and plan.
[6] See also the Programme Context section in Chapter 1, *Introduction*.
[7] Defining "a sound development environment" is beyond the scope of this study, but the principles exposed in the World Bank's Comprehensive Development Framework approach are sound. These are (1) the need for a long term vision and strategy; (2) country ownership of development goals and actions, (3) partnership among stakeholders, and (4) accountability for development results. See <http://www.worldbank.org/cdf>.

demonstrates that future UXO clearance can be justified ***on economic grounds alone***.[8] Moreover, the analysis shows that the decision to establish the Lao National UXO Programme (UXO LAO) as the national clearance centre was certainly defensible on economic logic, as future benefits should eventually justify the heavy start-up and capacity-building costs. Conversely, the analysis for Mozambique suggests that large-scale clearance of agricultural land will not, in itself, make a significant net contribution to Mozambique's continued development. A more targeted approach is appropriate, and two suggestions are offered:

First, adequate land is generally available in all regions except Mozambique's south. But even there the main vulnerability cited by farmers is drought, not a shortage of land. This suggests that economic ***and*** social benefits would accrue more from investments in water control than general mine clearance, and clearance activities should support small-scale irrigation and other water projects.

Second, seasonal labour shortages — and particularly women's labour — are typically a more binding constraint on smallholder agricultural production in Mozambique than is land. A 10 per cent increase in the time women have available to tend crops would pay greater dividends than a 10 per cent increase in the land available for cropping. Once again, mine action in support of village water projects that reduce the time women spend collecting water would result in higher economic and social benefits than general mine clearance of agricultural land.

The lesson from economic analysis[9] suggests that mine action managers need to understand the principal social and economic features of the mine-affected countries and their communities and identify the specific factors that limit economic growth and bind people in poverty. Mine action that addresses these binding constraints should be accorded priority.

The information economics of mine action

The study acknowledges and supports the consensus that the humanitarian imperative dominates mine action priorities in the conflict and immediate post-conflict period. It will also dominate during the start-up phase of new mine action programmes even when, as in Lao PDR, this occurs well after the conflict has ended. However, in this latter case the consensus that "compassion rules" in priority setting is not always based on the certainty that this is the best thing to do. Rather, as the discussion in Chapter 2 on the Landmine Impact Survey makes clear, this is the best we can do, given available information.[10]

[8] This is an important finding given the conclusion of the first published cost-benefit analysis of mine action (Harris, 2000a) that: "No matter how much the benefit figures are reconsidered, the costs of de-mining in Cambodia — and almost certainly in other low income areas — are far greater than its benefits" (p. 223).

[9] The study of mine-contaminated communities in Yemen in Chapter 2, using the methods of rural sociology, found that blocked access to water was a good predictor of the likelihood of mine accidents. Water is often a critical resource in developing countries.

[10] Chapter 2 also makes clear that the way forward is not simply to collect more detailed information within the Landmine Impact Survey. Efforts to collect more quantitative data at this stage (e.g., the area mined rather than simply the presence of landmines) would result in a parallel decline in the reliability of that data.

In many ways mine action management is as much about information as it is about landmines. In the early days of a programme, the struggle is to acquire a comprehensive base of information. The Landmine Impact Survey does this in order to assess the scope of the contamination problem and to identify a limited number of communities — those that stand out in sharp relief because of the risk of future accidents — for priority action. By necessity, some detail is sacrificed for comprehensiveness. Over time, more detailed information, reflecting a broader range of social and economic concerns, is required to make ever-finer decisions concerning priorities. Acquiring this information entails costs. How can the right information be obtained at the right cost?

Two broad strategies can be employed. The first is analytic: roughly, using more data and more processing. The second is responsive: adopting the priorities identified by government officials, community representatives, and other development actors. Both approaches have merit and should be seen as complements rather than alternatives.

Responsive approaches tap into the information and expertise of others, who often are far more knowledgeable than mine action personnel on the problems posed by contamination and the opportunities likely to arise if that contamination is addressed. Responding to priorities identified by local people also increases their sense of ownership. The danger with responsive approaches is that government, community, or aid agency officials may, through ignorance or wilfulness, represent their interests over those of the people in mine-affected communities. Therefore, for two reasons, mine action organisations cannot afford to abandon analytic approaches. First, they must be in a position to determine whether the priorities identified by others are reasonable and are likely to represent public rather than private interests. Second, because other development actors often fail to incorporate mine and UXO contamination into their planning, mine action organisations must have sufficient knowledge to be proactive in obtaining the information and co-operation they require from these expert sources.

The study finds that the information required for proper mine action management expands in both scope and detail over time. In a sound development environment, a modest capacity for socio-economic analysis is required by mine action programmes to ask the right questions of the right people to obtain the required information. Where the development environment is less than ideal — whether through failures of the government, the donor community, or both — mine action programmes require greater capacity to obtain the necessary data and undertake their own socio-economic analyses to turn this data into useful information. However, even in very imperfect development environments, partnering with other willing development actors — including local community-based groups — is usually better than operating independently.

Measures of our ignorance

This report documents approaches that can be used to (1) set priorities based on the problems created by landmine and UXO contamination, and (2) evaluate some of the principal benefits arising from mine clearance. It also provides

brief examples of how the benefits accruing to risk reduction might be evaluated. But these latter examples remain largely hypothetical and, hence, rather unsatisfactory.

In the case of risk reduction, the study team did not come across a single report that adequately documents how much the accident rate has fallen due to mine action. While it is clear that the numbers of landmine and UXO accidents have fallen in many countries having mine action programmes, it remains unclear how much of the decline is the result of mine action. Declines also result from people learning to avoid contaminated areas or from "spontaneous" declines in risky behaviour.[11] As well, a significant proportion of the decline may simply reflect the end of large population movements caused by conflict and re-migration.

Untangling this skein adequately would require accident data over time for contaminated communities that have not received mine action assistance, so these could be compared with similar communities that have received such assistance. Of course, once a mine action programme is established in a country, it would not withhold assistance from certain communities so such an experiment could be run. While a number of countries that did not have mine action programmes in place until years after a conflict (e.g., Lao PDR) could serve as "natural experiments", in no case do we have adequate data to chart the decline in accidents over time. These problems are further complicated because data on current accidents is incomplete in most countries with established mine action programmes. Therefore, we remain unable to determine the impact of mine action in total, let alone estimate the decline in accidents due to the various components of mine action such as mine awareness or clearance.

The task of evaluating victim assistance efforts is perhaps even more complicated[12] because the term embraces so many objectives and activities.[13] Even restricting the analysis to the survivors of landmine/UXO accidents themselves, there is a wide continuum of care required, stretching from emergency medical care through continuing medical treatment then a number of stages of rehabilitation (physical, psycho-social, socio-economic). Complementary measures are required (e.g., legislation, community disabled committees) to lessen discrimination against disabled persons. Also, costs associated with assisting landmine survivors are largely determined by the capacity of the local public health system. If major components of this system (e.g., prosthetic centres) must be built from scratch with international assistance, costs increase massively but these services are then available to all the physically disabled (and often to combatants injured by landmines) — what portion of these capacity-building costs should be apportioned to landmine survivors?

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[11] This could result from "demonstration effects" (i.e., seeing one's neighbours blown up while trying to harvest landmines/UXO) or because destitution falls as the conflict recedes and normal lives are resumed.

[12] As of writing, the Survey Action Center/Vietnam Veterans of America Foundation in Washington DC are planning to conduct a study to quantify the benefits of mine victim assistance.

[13] As well, the definition of "victim" often includes not only those directly injured by landmines but also their families who suffer emotional, social and economic hardship, and even mine-affected communities who lose access to land and other resources.

Concluding remarks

In sum, mine action has made great strides over the past decade and further improvements can be expected in the coming ten years.[14] Central to the ongoing performance improvement process will be careful control of costs; enhanced priority-setting based on responsiveness to stakeholders using transparent criteria (supplemented by socio-economic analysis); and a readiness to embrace ever closer co-ordination with development initiatives, particularly by exploiting the spatial planning opportunities afforded by GIS. The present study represents only a first step in this process.

[14] By the end of the decade, a number of States that adhered quickly to the Ottawa Convention on the Prohibition of Anti-Personnel Mines should have cleared all anti-personnel mines on their territory. In addition, the United States 2010 demining initiative should have come to fruition.

Chapter 1

Introduction

Background to the study

Historical background to mine action

At the end of the 1980s, as the international community became aware of the significance of the global impact of the indiscriminate use of landmines, a series of programmatic interventions were developed or strengthened to respond to the crisis. A range of mine-specific humanitarian activities have since evolved: minefield survey, minefield marking and fencing, mine clearance, mine awareness, mine victim assistance, and mine ban advocacy. Taken together, they have become the core components of what is now referred to as "mine action". Though initially dominated by military figures and organised in accordance with emergency response procedures, mine action has increasingly sought to join with traditional development activity.

The objective of the study and its intended beneficiaries

But mine action means much more than merely certain mine- or UXO-specific interventions. According to the UN Mine Action Service (UNMAS), it comprises:

> "*all the activities geared towards addressing the problems faced by populations as a result of landmine contamination. It is not so much about mines as it is about people and their interactions with a mine-infested environment. Its aim is not technical – to survey, mark and eradicate landmines – but humanitarian and developmental – to recreate an environment in which people can live safely, in which economic, health and social development can occur free from the constraints imposed by landmine contamination, and in which victims' needs are addressed.*" (UNMAS, 1997a)

The various constituencies in the mine action community have already made significant strides in grappling with mine action in a humanitarian or development setting. In brief, mine action programmes are becoming better managed and further progress can be expected for a significant period of time. Yet, although mine action is a relatively young discipline, its cost-effectiveness is coming under increasing scrutiny by donors

and academics alike. Thus, the primary objective of this *Study of Socio-Economic Approaches to Mine Action* is to identify social and economic analytical tools by which mine action programmes can be more effectively planned, managed and evaluated.

Accordingly, the Study is intended to provide guidance and focus primarily to mine action programme planners and managers, but also to donors, by generating opportunities to assess more effectively the relative benefits and costs of mine action programmes. Of course, the ultimate beneficiaries of the Study should be mine- and UXO-affected communities.

Study methodology

The *Study of Socio-Economic Approaches to Mine Action* was officially initiated in November 1999 at the behest of the United Nations Development Programme (UNDP). UNDP contracted the Study to the Geneva International Centre for Demining (GICHD), an international organisation dedicated to advancing the cause of mine action around the world. The final terms of reference of the Study were developed at a two-day round-table of selected experts (the Study Core Group),[1] who met in late October 1999 in Geneva to confirm the aim, scope, constraints and overall framework of the study.

The evidential core of the Study is its three case studies, which are included as Appendixes 1-3 to this report. Through discussions with stakeholders and concerned communities the case studies sought to document, from both a social and an economic perspective, how the mine threat is assessed currently, how priorities are determined by mine action programme planners and managers, taking into account external factors, and how the impacts of mine action programmes are evaluated. The three mine action contexts selected — Kosovo, Mozambique, and the Lao PDR — were chosen to represent post-conflict emergency, transitional, and development contexts for mine action, respectively.

The Study began with a detailed literature search and review and an overview of relevant ongoing initiatives, in particular the Landmine Impact Survey being implemented by the Survey Action Centre (SAC) in Washington. Terms of reference and partners for the country case studies were developed in parallel with this effort. In Kosovo, Shawn Messick, a consultant with SAC, was chosen to research and write the case study, the original draft of which was submitted in February 2000. In October 2000, John Flanagan, the head of the UN Mine Action Co-ordination Centre in Pristina (MACC) provided information to update the case study. Ted Paterson, a consultant with the GICHD and UNMAS, conducted field research in the Lao PDR in May 2000 and wrote the case study report and accompanying economic analysis. Mr Paterson also developed the sections devoted to the economic analysis of mine action in Kosovo and Mozambique.

The Mozambique case study was researched and written by Ananda S. Millard and Kristian Berg Harpviken of the Assistance to Mine-Affected Communities Project (AMAC), based within the International Peace Research Institute, Oslo (PRIO) using funding provided by the International Development Research Centre (IDRC) in Johannesburg. During her field research, Ms Millard conducted three case studies of mine-affected communities, spending approximately two weeks in the field for each

[1] The role and responsibilities of the Study Core Group are defined in *Appendix 4* and the members of the Group are listed in *Appendix 5*.

case. In addition to the community case studies, the report also draws on document studies, interviews with key individuals in Mozambican mine action and on earlier field research conducted by Millard for the AMAC project. The earlier field research was conducted in October 1999 and was facilitated by Norwegian People's Aid (NPA) Mozambique. An in-depth AMAC report, including the three community studies in full, has been issued as a PRIO report in both printed and electronic form.

Ian Mansfield, the Mine Action Team Leader at UNDP, provided overall guidance throughout the project. Eric Filippino, the head of the Socio-Economic Study Group at GICHD, was responsible for the conduct of the study. Ted Paterson wrote and edited the study report with Stuart Maslen;[2] Chapter 2, however, was contributed by Aldo Benini of SAC, Washington DC. Jack Glattbach copy-edited the final draft text and Françoise Jaffré laid out the report for final publication.

The first draft of the Study was discussed at a meeting of the Study Core Group in New York in August 2000. Following this meeting, revisions and additions were made to the text and a second draft was circulated to the Core Group in late November 2000. A small meeting of relevant experts was hosted by SAC in Washington in early December 2000, focusing on the economic analysis developed by the Study. Following this meeting, and taking into account other comments from the Core Group and other stakeholders in the case studies, the Study was finalised and printed. An Operational Handbook to assist in the implementation at field level of the study's recommendations will be field-tested during Spring 2001; once finalised, the Handbook will be distributed by the UNDP Mine Action Team in New York.

Report layout

In addition to the main findings and the present introduction, the Study is made up of five chapters and a series of Appendixes. Chapter 2 addresses the impact of mine contamination, looking specifically at the ongoing Landmine Impact Survey being co-ordinated by SAC in Washington DC. Chapter 3 discusses the socio-economic analysis of mine action, with particular attention paid to the economic analysis of mine and UXO clearance. Chapter 4 considers how priorities are, and should be, set in response to government priorities, priorities set by other development actors, and community needs. Chapter 5 considers the monitoring and evaluation of mine action, looking at how far mine action has — to date — been willing to embrace developmental approaches to these techniques. Chapter 6 assesses the role, actual and potential, of GIS, not only within mine action but also in wider development co-ordination. Following the Study bibliography, the Appendixes contain edited versions of the three case studies from Kosovo, Lao PDR, and Mozambique, respectively.

Relevance of socio-economic approaches to mine action

Value to mine action of socio-economic approaches

As is the case with other organisations faced with mammoth tasks and modest resources, those in the mine action community are forever confronted with two principal challenges. First, they want to ***do the job right*** — an issue that has correctly

[2] Both Ted Paterson and Stuart Maslen worked as GICHD consultants.

taken pride of place in mine action because of the terrible safety issues posed by mine and UXO contamination, and the threats to life when accidents occur. The technical expertise of military engineers, health care professionals, and public educators is needed to ensure that all mine action tasks are done safely and efficiently. But second, mine action organisations need to ensure they are ***doing the right job***. Socio-economic analysis comes to the fore in addressing this second issue.

Mine action directly improves people's security, and hence their lives, when it removes clear and present dangers posed by contamination, whether through clearance, marking, or awareness building. Landmine contamination also imposes constraints on the use of land and freedom of movement. Mine action removes these constraints, allowing communities to recover from conflict. It can also create new opportunities for people, individually and collectively, to build more prosperous and sustainable livelihoods. But these opportunities are not certainties. The long-term benefits of mine action therefore depend on, first, whether the opportunities created are large or small and, second, the likelihood that people in affected communities will be able and motivated to rebuild their communities and capitalise on new opportunities created.

In brief, mine action organisations can enhance their impact by targeting larger opportunities and more pressing constraints. Unfortunately, there are no ready maps marking such targets. Indeed, similar patterns of contamination will pose different problems in different mine-affected communities, and individuals within each community often will have very different views on which mine "actions" should be undertaken first. In the absence of ready maps, reasonable people need to use reasonable approaches to assemble evidence that can point to large opportunities and pressing constraints, thus identifying the "right job" at any particular time and place. The various social science disciplines such as economics, anthropology, and sociology all provide reasonable approaches for collecting and interpreting evidence concerning the problems posed by mine contamination, the potential benefits that may accrue if these problems are addressed, and the likelihood these benefits will be realised.

Like others in the international humanitarian and development communities, mine action organisations must also demonstrate to donors, local government agencies, and people in the affected communities that they are doing the right job and doing it right. Project and programme plans outline how problems will be solved on paper. But eventually mine action organisations must show they have made an impact, which simply means they have improved people's lives "out there" in the real world. This is a difficult task. The social sciences also offer concepts for describing and measuring the benefits accruing from mine action, thus providing a basis for accountability plus feedback to allow learning from experience and improvements in performance.

Socio-economic approaches allow us to compare alternative mine actions, select the "right" or most beneficial tasks, and demonstrate that valuable results have been obtained. In short, the value of socio-economic approaches to mine action is that these approaches allow us to value mine action and its achievements.

Implications for mine action operations of socio-economic approaches

The various social science disciplines provide different systems for assembling data and converting it into useful information — the right data in the right format at the right time to the right person. Systematic information allows donors and others to identify which mine action programmes, and which organisations, are delivering the most benefits with the resources entrusted to them. Systematic information also allows mine action personnel to learn about the real problems created by mine contamination and how best to address these. The best learners will prosper and the performance of the mine action community will, over time and on average, improve. If the collective performance of the mine action community is good and getting better, donors will continue to provide funds rather than reallocating these to other humanitarian and development pursuits.

The implication is that socio-economic approaches provide means for evaluating mine action. A further implication is that "learning organisations" will prosper. Given that this process is already well under way, mine action programmes and individual organisations have begun to devote resources to understand better the social and economic implications of mine contamination and mine action and to learn how to improve performance. It should be borne in mind, however, that socio-economic analysis itself consumes scarce resources. While mine action will benefit from socio-economic analysis, at some point the costs of further analysis outweigh the incremental benefits.

Programme context

The nature of a mine action programme depends on many factors. Some of these relate to the nature and extent of mine contamination, but others include (1) the country's economy and social structure, (2) the workings of the donor community in that country, and (3) the progress — or lack thereof — toward peace and sustainable development. To do their tasks correctly, mine action organisations must understand landmines and UXO. But to select the correct tasks, these organisations must understand the context in which they operate.

Socio-economic context

Effective mine action organisations work on the priorities of the people in mine-affected countries and communities. Setting the proper priorities requires an understanding of the basic features of the local society and economy. How are people organised into households, communities, tribes, and so on? How do households meet their food and income requirements, and to what resources do they need access in order to sustain independent livelihoods? What are the main risks they face, and what strategies do they employ to cope with misfortune? Are households relatively equal or are there vast differences in wealth and status? Is the society homogeneous or are there pronounced ethnic, linguistic, or religious divides? What domestic and economic tasks fall to women alone? Does significant trade take place across regions, between rural and urban communities, and with the wider world? Can the State provide basic public services to the bulk of its citizens?

Such socio-economic features will largely determine what the affected communities will identify as priorities for mine action. Therefore, the key to improving the effectiveness of mine action programmes is, to a large degree, enhanced knowledge of the socio-economic structures of mine-contaminated communities.

Development actors

Successful mine action organisations need expertise on the technical aspects of mines and UXO plus the capacity to learn about the socio-economic milieu in which their beneficiaries live. They also need to operate effectively within the global aid system — with its many flaws — to get the resources needed to help mine-affected communities. Success requires learning the ways of the world's humanitarian and development agencies, a community with its own distinct culture, norms, and habits of mind. This community, and the aid system in general, appears to have many strange practices. It funds short-term projects to tackle long-term problems. It employs rigid, mechanical planning models to deal with complex and shifting development problems. It throws money at certain countries or issues while ignoring others that are equally pressing. To achieve their missions and, sometimes, simply to survive, mine action organisations must understand the "rules of engagement" governing aid operations: how to keep donors satisfied and compete with other worthy organisations for funding (See Box 1). For while "development fashions" come and go, long-term success depends on achieving results. (See Box 2: *The Language of Results*).

Landmine contamination imposes new constraints on poor communities, rendering land unusable, causing insecurity, isolating communities and, most tragically, killing and maiming innocent people. These new constraints are the negative impacts of landmine contamination, which landmine impact surveys aim to document as a basis for establishing priorities. (See Chapter 2: *Assessing the Impact of Mine Contamination*.) Successful mine action can remove these new constraints, allowing the affected communities to recover. In the language of results, mine action outputs such as usable land, safe roads, and people who can conduct their daily affairs with security, may lead to recovery as an outcome. However, if the country and its communities were poor before the conflict, recovery implies continued poverty. The impact of mine action alone will not be the transformation of underlying social and economic features of countries and communities. To contribute to such a broader impact, mine action organisations need to adopt loftier objectives or, more commonly, team with other development actors who aim to alter the underlying social and economic structure that trap communities in poverty.

Conflict and post-conflict situations[3]

The nature of the development *problématique* in a country, hence the current preoccupations of the development community working there, evolves over time for a variety of reasons, including the changing course of conflict. The threat from landmines and other battlefield debris exists, by definition, as a result of conflict. Such conflict may be regional, involving two or more countries, or it may be internal, involving two or more armed factions. Conflict may also exist within a country between the governing authorities and armed groups of the population. Regardless of the form and extent of the conflict, UXO caused by the conflict has the potential to create a lasting humanitarian problem — with social, economic and environmental dimensions.

[3] This section is adapted, with thanks, from McAslan and Bryden (2000).

Box 1: The Logic of Development Programmes

Development is a complex phenomenon and a difficult task, further complicated when foreign donors provide the resources needed to promote development. The international development community has created a variety of tools to cope with these complications, which have in turn spawned a specialist language within this community.

Many of the tools are based on "programme logic" models. In brief, the plan for a project is built by:

- first, identifying the development problem and, hence, the purpose of the project;
- second, identifying what the project must produce (outputs) to address the problem;
- finally, specifying the inputs needed to produce those outputs, thus defining the logical sequence:

Inputs ⇨ **Outputs** ⇨ **Purpose**

If the problem is too large or complicated to manage as a single project, a programme will be established. This is simply a collection of development projects, each designed to address part of the problem. The solution to the overall problem (i.e., the big objective) can be termed the goal, and the chain of logic then becomes:

Inputs ⇨ **Outputs** ⇨ **Purpose** (Project objective) ⇨ **Goal** (Programme objective)

Building on this approach, many development agencies require the use of "logical framework analysis" (LFA). The framework is created by putting the logical sequence in one column, and adding columns for — in the traditional version of an LFA — (1) the information needed to assess whether progress is being made, (2) how that information will be obtained, and (3) critical assumptions[a] underlying the plan. Below is a highly summarised representation of the project's logic and how progress will be monitored and evaluated.

The Traditional Logical Framework Analysis[b]

Logic	Progress indicators	Means of verification	Critical assumptions
Goal	Indicators of goal attainment.	How to obtain the goal indicators.	Assumptions
Purpose	Indicators that the project's purpose has been attained.	How to obtain the purpose indicators.	Assumptions
Outputs	Indicators that specified outputs have been delivered.	How to obtain the output indicators.	Assumptions
Inputs	Indicators that the inputs were available.	How to obtain the input indicators.	Assumptions

[a] Assumptions underpin the logical argument for the project. Thus, the project goal should be attained if (1) the project's purpose was achieved and (2) the listed assumptions hold true. If one discovers the assumptions will not be true, the project will need to be re-thought and perhaps re-designed.

[b] There are many variants.

Box 2: The Language of Results

The concerted effort to promote development in Asia, Africa, and the Americas began in earnest in the 1950s. While a number of countries have achieved stunning success, results have generally been disappointing. There are more people living in absolute poverty today than ever before, and many countries are now worse off than a generation ago. Unsurprisingly, many observers and donor governments have criticised the performance of the development industry, leading most development agencies to intensify their focus on achieving results. Results arise at many levels. For example, the following is a list of what might be achieved, in whole or in part, through mine action in a community:

- One hundred landmines are removed and destroyed;
- Six hectares of land are cleared;
- Twelve tons of wheat are grown on the cleared land;
- Three families sustain themselves and prosper on the cleared land.

The first two examples in the list are ***outputs*** — things achieved directly by the mine action agency using the inputs provided by donors. The third example is an ***outcome***, arising when the intended beneficiaries use the outputs to achieve something they value. The final item is an ***impact*** — the enduring socio-economic effect to which mine action has contributed.[a] In fact, a hierarchy or chain of results exists in which outputs contribute to intended outcomes, which in turn contribute to the broader social and economic impacts desired.

This "results chain" corresponds to the programme logic sequence outlined in the previous box, and can be summarised in a variation on the traditional LFA.

The results-based logical framework analysis

Logic chain	Results chain	Progress indicators	Critical assumptions
Goal	Impact	Impact indicators	Assumptions
Purpose	Outcome	Outcome indicators	Assumptions
Inputs	Output	Output indicators	Assumptions

[a] This specific use of the terms "output", "outcome", and "impact" is from the Canadian International Development Agency, but most agencies use close variants.

The circumstances that exist after a conflict has ended depend on many factors, and the form and extent of the required humanitarian and developmental assistance will vary. However, for planning purposes five general ***states*** can be identified between the extremes of ***open conflict*** and stable ***self-dependency***.

Open conflict ⇨ Humanitarian emergency ⇨ Transition assistance ⇨ Assisted development ⇨ Stable self-dependency

Of course, there is no guarantee that a country in conflict will progress smoothly through these five states.[4] Indeed, it is possible for more than one of these states to co-exist within the same geographic area. Local conditions may enable one part of a country to progress rapidly *to* ***stable self-dependency***, or at least to ***assisted development***, while ***open conflict*** may continue elsewhere. Afghanistan, Somalia and Sudan are examples of countries where different states of conflict and post-conflict currently co-exist. This report deals with the three of these five states that are most relevant to mine action: humanitarian emergency, transition assistance, and assisted development.

[4] Some modern conflicts — termed "complex emergencies" — shred the institutional fabric of a society. In complex emergencies, movement through the five states should be viewed more as an **objective** than a **natural progression**.

Humanitarian emergency

The absence of conflict does not necessarily indicate that all warring factions are willing and keen to accept the *status quo*. It may indicate fatigue, or the opportunity to consolidate and regroup, or it may be the result of an enforced and unwilling compliance by massive, well-resourced and capable peacekeeping forces. In the immediate aftermath of conflict, the conditions for a stable, long-lasting peace are unlikely to be present.

This phase may also be characterised by the absence of a coherent and effective governing authority. There may be a serious ongoing threat from undisciplined factions and militia with local opposition to peacekeeping activities. The civil infrastructure may have collapsed and there may be large numbers of refugees and internally displaced persons. There will be despair and a high level of deprivation and suffering.

Such deprivation and human suffering will attract international interest and the call for an urgent humanitarian response. This response will be underpinned by the international non governmental organisations (NGOs) and aid agencies, assisted by a plethora of *ad hoc* relief initiatives. Although well intentioned, these initiatives may not be accurately focused, and the support provided may not always be appropriate. The United Nations Emergency Relief Co-ordinator will be responsible for providing cohesion and coherence to the international relief programme(s).

The mandate for international assistance will normally be based on Chapter VI of the United Nations Charter. United Nations military forces may be needed for peacekeeping, but their effectiveness and utility will be subject to the consensus and consent of the former warring factions. Peacekeeping tasks may involve: observation, monitoring and the supervision of truces, cease-fires and elections; interposition; demobilisation and disarmament; humanitarian relief and its protection; and the establishment and maintenance of law and order.

Initially, emphasis will be given to mine action in support of emergency humanitarian activities and peacekeeping tasks, rather than building an effective indigenous capacity. Although there may be much confusion and uncertainty at this early stage, it is vital that all forms of mine action are co-ordinated at the earliest opportunity.

Civilian agencies will be encouraged to deploy demining teams. Such teams may initially require support and assistance from in-place peacekeeping forces, including information on the general security situation as well as technical intelligence on the mines and mined areas. Some logistic support may also be necessary, particularly during the initial stages. The scale and impact of the mine threat will become more apparent at this stage with an increasing demand for appropriate, effective and timely victim assistance, together with a growing need for mine awareness — in particular for refugees and internally displaced persons as they return to their homes in greater numbers.

It may be necessary for peacekeeping forces to support civilian agencies with the mapping of mined areas, and some hazardous areas may need to be marked and fenced. Peacekeeping forces will not normally be used for humanitarian demining, although there may be circumstances when limited military involvement would be appropriate — such as route clearance to enable the delivery of essential

humanitarian supplies, or to provide an interim capability prior to civilian agencies being deployed.

Transition assistance

A crucial period exists between the ***humanitarian emergency*** and ***assisted development***. During this ***transition*** phase the emphasis will shift from urgent humanitarian assistance to longer-term reconstruction and development. Projects will include the building of basic accommodation for shelter, medical care and schooling, and the development of a communication network. External assistance (including the use of peacekeeping forces) may be needed for urgent reconstruction activities, although care must be taken to prevent a dependency culture that will hinder a return to normality. The end of this period will be marked by the emergence of a recognised governing body demonstrating effective governance, and an effective legal system that guarantees fundamental human rights. The structures will be in place to ensure that funding for longer-term development programmes can be applied judiciously.

During the ***transition*** phase, emphasis will be placed on building an indigenous mine action capacity including: institutional and legal arrangements, the training and deployment of mine survey and clearance teams, the development of a national mine action authority — often referred to as a mine action centre — and the transfer and collation of information from NGOs, civilian agencies and United Nations peacekeeping forces. United Nations responsibilities will focus on the mobilisation and prioritisation of resources, and the provision of an effective interface between the host nation, donors and demining agencies. The United Nations will continue to provide guidance on clearance standards, technology and quality.

In this phase, there are often very large demining investments made to support the rehabilitation of the transportation system (roads, railways, air and sea ports), public utilities (power, water, communication), and other critical economic assets, such as factories and mines. These investments are designed to "jump-start" the economy, re-establish basic public services, and facilitate the transition from war to sustainable development.[5] Because speed is essential, the funding agencies will often choose commercial demining firms and the need to build local mine action capacity may not be fully considered. It is important that mine action organisations meet the relevant donors and encourage them to consider the longer-term implications of their plans. Frequently, such projects can be designed to contribute to long-term solutions as well as achieving the task at hand.

Assisted development

A key characteristic of the ***development*** phase is the existence of a central governing authority with a clear mandate from the population, and with the growing confidence of the international community. By this stage, essential services and utilities will have to be restored, the fear of violence will have abated, opportunities for employment will be improving, and the foundations will be in place for a recovery to a state of ***stable self-dependency***. International assistance will focus almost entirely on longer-term reconstruction and redevelopment programmes; in particular those aimed at restoring the country's infrastructure, services, agriculture and industry.

[5] See World Bank (1998).

By this stage it is likely that the responsibility for mine action will be vested in the host nation, although some assistance may still be required from the international community. The priorities for mine action will be determined nationally, with advice from the United Nations. Ideally, mine action programmes will use local managers and local manpower, although it may be necessary to use external agencies for the provision of specialist equipment, services and, if requested, quality control and financial audit.

Chapter 2

Assessing the impact of mine contamination

Mine action management can be as much about information as it is about landmines — and acquiring comprehensive bases of information is a major struggle in the early days of mine action programmes. To strengthen the information baseline, Landmine Impact Surveys can effectively assess the scope of contamination and help identify communities for priority attention by mine action programmes. This chapter, based on a submission from Aldo Benini of the Survey Action Center (SAC) in Washington DC, describes the concepts, techniques and constraints of Landmine Impact Surveys, which represent the core of the Global Landmine Survey process being managed by the SAC.

Introduction

Some 60 countries, especially in the developing world, are currently affected to a greater or lesser degree by landmines and other explosive remnants of war. The widespread use of landmines and/or the presence of UXO typically results in prolonged and acute social, economic and environmental harm extending far beyond the localised human suffering commonly inflicted by other conventional weapons. They impact negatively on development, obstructing post-conflict rebuilding, and the provision of, and access to, health and education, rendering fertile agricultural land unusable, and impeding the free circulation of goods and labour. And the high levels of disability that result, in particular from the use of anti-personnel mines, affect not only the individuals caught in a mine blast but also their families, and in turn, their communities and society at large.

Yet, not all mine-affected countries and communities suffer equally. Some are better equipped — and resourced — to deal effectively with the threat than others. And since international funding is limited, careful attention must be paid to determining who is most in need of outside assistance, and with what level of urgency. As a consequence, from its inception, mine action has sought to quantify the scope and nature of the threat posed by landmines and UXO as part of the requisite planning and prioritisation process. Initially, assessments tended to be formulated in terms of numbers of mines. Notoriously, these early estimates were often found later to be

exaggerations, and quantities of explosive remnants of war did little to categorise the threat posed to communities. Later, the size of areas of land suspected to be contaminated was calculated, but still the information provided was inadequate.

Planning for mine action requires accurate and timely information on the form, scale and impact of the threat posed by mines, UXO and other explosive hazards. Such information will come from assessment missions and surveys, from ongoing local demining and mine awareness projects and tasks, and from local knowledge. Surveys involve the systematic collection, assessment and processing and recording of information. The information gathered from mine action surveys will normally be "owned" by the national mine action authorities, and should be made widely available.

The definition and categorisation of mine action survey have developed, and continue to develop, to reflect the changing requirements and perspectives of the international mine action community.

In July 1996, international standards for the survey of mined areas were proposed at a conference in Denmark. These proposals were taken forward by a United Nations-led working group and incorporated with other recommended procedures, practices and protocols into the United Nations' *International Standards for Mine Clearance Operations*. The standards proposed three levels or functions of survey: a general (level 1) survey to collect information on the general locations of suspected or mined areas; a technical (level 2) survey to determine, accurately delineate, and, if possible, mark, the perimeter of mined locations initially identified by a general survey; and a completion (level 3) survey to accurately record the area cleared.

Not long after these standards were published, it was recognised that the survey process should not only define the form and scale of the mine and UXO hazardous areas, but should also address the impact on individuals and communities affected by the mines and UXO. This important change in emphasis was led by the Survey Working Group, which represented a group of NGOs active in mine action. The experience gained over the last three years has been invaluable in understanding the needs, scope, and indeed the limitations, of mine action survey at national and local levels.

These lessons learned are reflected in the revised International Mine Action Standards (IMAS). IMAS has dropped the terms level 1, 2 and 3. Instead, it uses the terms ***national survey***, ***technical survey*** and ***post-clearance documentation***.

A ***national survey*** is defined as "a comprehensive inventory of all reported and/or suspected locations of mine and UXO contamination, the quantities and types of explosive hazards, and information on local soil characteristics, vegetation and climate; and an assessment of the scale and impact of the landmine problem on the individual, community and country". These two elements of a national survey (recording the mine and UXO hazards and assessing the impact) are interdependent, although in some situations it is not possible to collect both categories of information concurrently.

A ***technical survey*** is defined as "the detailed topographical and technical investigation of known or suspected mined areas identified during the planning phase. Such areas may have been identified during a national survey or have been otherwise reported. The primary aim of a technical survey is to collect sufficient information to enable the

clearance requirement to be more accurately defined, and for the subsequent clearance operation to be conducted in a safe, effective and efficient manner".

IMAS replaces the concept of a "level 3 survey" by providing general guidance on the type of information required on completion of the task. This should include details of the cleared area(s) — as proposed in the original "level 3 survey". But it should also include *inter alia* details of the clearance organisation, procedures and equipment used to clear the area, details of the quality assurance conducted and post-clearance inspections, details of reduced and cancelled area(s), and details of any incidents and accidents.

Although not addressed in IMAS, the concept of a "level 4 survey " has been suggested as a means of confirming whether land is being used after clearance as envisaged. Such a survey would represent a logical final stage in the process of identifying and assessing the scale of the hazard and its impact, planning for the removal of the hazard, removing the hazard, and finally confirming that the impact has been removed — or at least reduced.

The scope and significance of the Landmine Impact Survey

Several Landmine Impact Surveys are currently being undertaken within the Global Landmine Survey process being managed by the SAC. The survey in Yemen was completed in summer 2000, and at the same time surveys were ongoing in Cambodia, Chad, Mozambique and Thailand. In a format adapted to the emergency conditions, a modified impact survey was done in Kosovo in winter 1999/2000.

The scope of the Landmine Impact Survey is deliberately limited. One of the essential objectives of the survey is to provide a ranking of communities by severity of mine impact that can inform the allocation of mine action resources. Indicators are used, and are combined in an index — the Mine Impact Score — to create the ranking. For that purpose, the Survey records types of problems that the mines have created for a community. It does not go deeply into measuring the numeric extent or degree of those problems.

Indeed, the value of the survey information must swiftly be addressed. Surveys are expensive, yet it is still rare that questions are asked about the value of the returned information, or about how design interventions might affect validity and reliability of surveys, and thereby their value.

A recent computer simulation undertaken by the SAC of the informational value of the Landmine Impact Survey using the Mine Impact Score that is its core (see below page 28ff.) explored this precarious terrain. In a hypothetical world populated with mined communities, two utility variables were evaluated against different information scenarios. These dependent variables were:

- The reduction in loss of life and health, measured as the difference between the number of victims in the past 12 months and the zero victims once the community has been completely demined; and
- The net present value of demining, defined as the present value of the income of demined cropping land and roads minus the cost of demining them.

A limited budget was voted for the total effort of demining in all scenarios. Communities were assigned for priority demining using these four criteria.

- A ***random-sequence scenario***, using no prior knowledge about the communities; it picked them in a random order from the list and continued demining until exhausting the budget.
- A ***minimal-knowledge scenario***, using the government census as prior information; it assigned communities by decreasing population size, on the assumption that mine hazards and road-demining benefits were positively correlated with population. It had the same budget limit as above.
- The ***Landmine Impact Survey scenario*** selected communities starting with those with the highest impact score. It had the same budget limit.
- The ***perfect-knowledge scenario*** was the baseline. It used the entire knowledge simulated into the data set.

However, since no monetary value of saved lives was permitted, the last scenario had to choose between a maximum economic benefit and a maximum accident reduction strategy. Both are possible; here we explore the economic strategy because it (imperfectly) emulates what a decision-maker with additional Technical Survey information (the closest to being omniscient!) could do. In other words, this scenario assigns communities by descending present value of demining.

The budget for these scenarios was arbitrarily set to equal the cost of the first 20 communities in the perfect-knowledge scenario. (The absolute values of the costs and benefits are almost irrelevant; what matters are the proportions between the scenario results.) Several simplifying assumptions were made. One of them was that communities are either completely demined, or not at all.

Only demining was considered among the repertory of mine action activities. The economics was limited to physical capital; the cost and benefits of victim care, rehabilitation, and of secondary effects on families were considered to be absorbed into the victim reduction variable. However, for a proper understanding of the model, it may be wise to state a principal difference: while, in the model, demining has only positive effects on hazard reduction, its economic value may be negative in some communities that have, for example, long stretches of road mined but have only small populations to benefit.

The results are summarised below. The perfect-knowledge scenario gives priority to high net-benefit communities; it spends most of its budget on a small number of communities with high demining costs but also high returns.

By contrast — and this is the interesting part — the Landmine Impact Survey portfolio is strongly drawn to communities with comparatively many recent victims. It has a low preference for communities with high economic benefits from demining. The reason is that the Landmine Impact surveyors do not effectively pick out such communities. The kind of information they are able to collect at this stage, and the qualitative scoring of the livelihood and institutional blockages, do not flag high-benefit communities of this type.

The population-based minimal-knowledge strategy does a better job than the perfect-knowledge strategy, simply because of a correlation between population size and recent victim numbers. The random-sequence strategy exceeds the Landmine Impact

Scenario	Communities demined	Cost of demining (US$)	Returns from demining (US$)	Net benefit (US$)	Annual victim reduction
All communities	91	1,524,579	2,872,508	1,347,929	74
Perfect knowledge	20	706,985	2,416,006	1,709,021	22
Landmine Impact Survey	38	600,947	985,062	384,115	59
Minimal knowledge	37	623,977	809,040	185,063	37
Entirely random	40	591,423	1,003,612	412,189	34

Survey portfolio in economic benefits. There are sample fluctuations in this scenario, of course, but it also did better in a second run. Many of these outcomes are variable with the model parameters, and more experimentation would be needed to explore sensitivities. However, two findings may be repeated in order to advance a tentative consequence:

- The Landmine Impact Survey-based portfolio does better in accident reduction than a purely economic benefit maximising strategy. By implication, it does more poorly on the economic side.
- It does better in accident reduction than a purely random selection of communities. However, it does not do any better in picking communities with good economic benefits from demining.

In consequence, there need to be bridging elements between the Landmine Impact Survey and a cost-benefit analysis of demining particular physical assets in the affected communities. A cost-benefit analysis would require information, for example, on farm productivity, precise surfaces and prices in the local property markets, things that the Survey does not collect.

It follows that the Landmine Impact Survey, if one looks only at the Mine Impact Score using current definitions, has value for the qualitative, compassionate, and victim-related mobilisation of mine action resources for affected communities. Information needed to make cost-benefit based decisions for physical asset demining will need to be collected in another step such as during a Technical Survey.

The results are very tentative. They are based on a simulation that has not widely varied its parameters, and has not done a great number of runs with the set parameters. More analysis is needed of the inferential potential of the survey data, and this will be facilitated when the correlations among indicators become empirically known from the first country surveys. It is desirable that developers of other indicator systems do similar investigations of their information value. As a form of such exercises, computer simulation should be used aggressively.

Of course, the purview of the Landmine Impact Survey may not satisfy all mine action professionals. In fact, because mine action is carried out, if not propelled, by professions with well-developed doctrines and strong networks, it is entirely foreseeable that pressure for the rationales, design and practice of Landmine Impact Surveys to change

will follow obvious professional lines:

- The demining community, staffed largely by ex-military personnel, will press for more Technical Survey elements to be included, enriching the Landmine Impact Survey with technical data. Their demands may go beyond the current provisions for size estimates and visual verification of mined areas. This behaviour is illustrated by the effort to draw mined area polygons during data collection in Thailand, prompted by the close co-operation between the foreign NGO and the national mine action centre, an organisation of the armed forces.
- The social and medical professions, concerned with victim assistance, may find systematic gaps, such as on the victims of older date, and will want to see the data collection formats changed to their needs.
- On the donors' side, the concern with the impact of the mine action projects will call for economic analyses, such as cost-benefit analyses, and thereby exert pressure for the adoption of stronger metrics.[1]

The Mine Impact Score as a compassionate measure

The Mine Impact Score is the central element of the landmine survey design. While its basic function — to permit a priority ordering of communities — is easy to understand, its technicalities may defy quick comprehension.

Technicalities

The Mine Impact Score is a property of the community, not of any or all of the mined areas in or around the community, nor of the victims that have come to harm there. The score is indifferent to the number and size of the mined areas; it responds to these three aspects of the local mine problem:

- The nature of contamination,
- The types of livelihood and institutional areas to which mines are blocking access, and,
- The number of recent victims.

Technically, the score is a linear combination of two contamination variables (presence of mines, presence of UXO), 10 livelihood and institutional blockage variables, and of the number of recent victims. The first two groups hold binary variables, with values 1 and 0, to express statements of the kind: "Problem of type X does occur somewhere in the community — yes or no". The number of victims, by contrast, is their actual natural number counted over the past 24 months, not the truth value of the assertion that there had been some victims in that period. The coefficients are the weights that users can set in response to their preoccupations and country conditions; the Survey Working Group, chaired by the SAC, that oversees the Global Landmine Survey process has prescribed weights for some of the variables and has given rules for others that country surveys may set within limits (Survey Action Center, 2000).

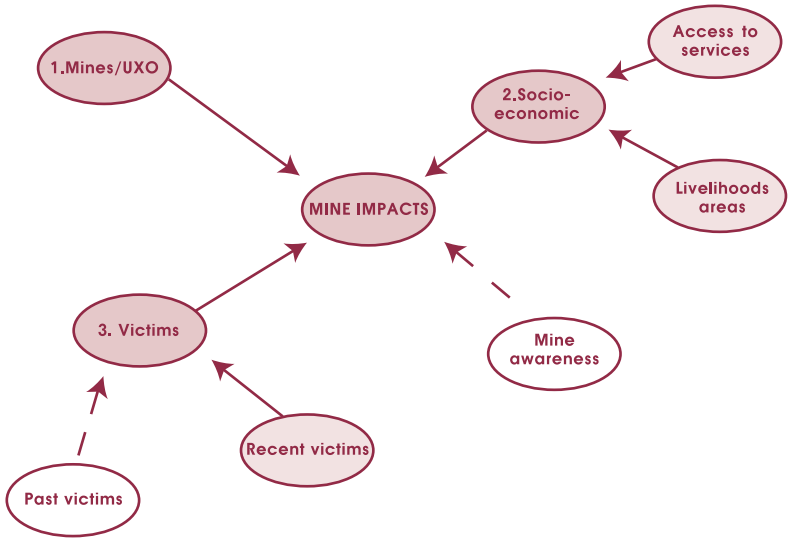
The 13 arguments of the score are composite truth values of qualitative statements, and the number of victims, over all mined areas in the community. Some of them are truth values of indicators that are themselves composite statements from several more specific indicators. For example, "Some infrastructure is blocked" is true if some bridge, power line, factory or any other of several specifically enumerated infrastructure subtypes is blocked. In terms of statement calculus, the sub-type and mined area-

[1] A metric is the set of technical instructions of how to measure a concept, condensed to a variable with permissible range of values, defined unit and dimension.

specific statements are connected by "disjunction", the "or"-operator (Stoll 1961:57); in the formal algorithm of the indexing machine the truth values of the composites are calculated as x = IF(SUM(arguments)>0,1,0).

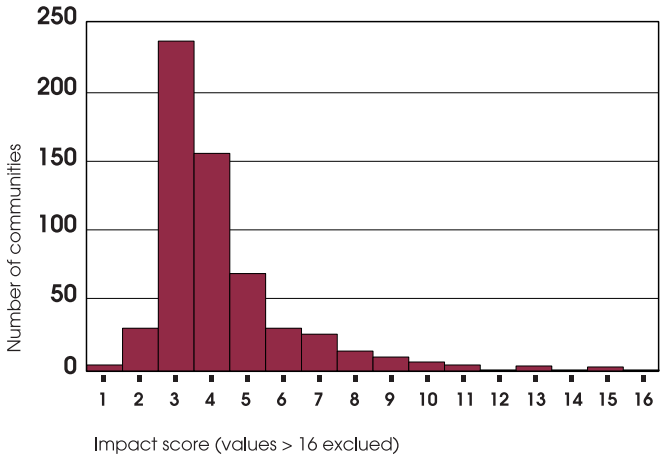
Figure 1 is an influence diagram of the concept of mine impact as used in the Landmine Impact Survey. Data on contamination, recent victims, as well as on livelihood and institutional blockages, is factored into the impact score. Some data is collected on victims of less recent date and on mine awareness education, but it does not influence the computation of the score.

Figure 1: Influence Diagram for the Mine Impact Concept Used in the Landmine Impact Survey



As an example of an actual result, Figure 2 displays the distribution of impact scores of the 592 affected communities surveyed in Yemen.

Figure 2: Histogram of the Community Impact Scores in Yemen



The left skew of the distribution is conspicuous. The majority of the affected communities in Yemen have low scores. Few communities (14) have scores higher than 10 and are considered, in the current classification, highly impacted.

Text and alphabet

The Mine Impact Score is a composite index, and the indicators that form part of it were first chosen by persons who had "knowledge of the subject matter" (hence its claim to "content validity"), but may not have bothered about how to implement a formal algorithm. Many of the survey contributors and users, however, may at best be indifferent to, at worst suspicious of, the way the indicators have been "hard-wired" into the Information Management System for Mine Action (IMSMA)[2] scoring algorithm. They may be confounded by the contrast between the limited freedom to set weights for the indicators on the one side and the inaccessible "black box" of the composite statement calculus on the other. They may intuitively understand the recent-victim variable, since counting and summing natural numbers is trivial, but may despair of understanding the remainder of the score's components.

They may be helped with an analogy: the relationship between a text and the alphabet. Suppose, for a moment, that the key community informants were using a special language for the accounts of the local mine problems they give the survey staff. In this language, every type of mine problem would be represented by a particular letter, such as "blocked access to irrigated crop land" by the letter "I". Each unit occurrence of this particular problem, such as an acre of blocked irrigated land, would give rise to an instance of that letter. As the interviewees described their community neighbourhood by neighbourhood, field by field, they would form words using those letters. The more pervasive the mine problems to be described, the longer their narrative — while the more diverse the problems, the larger the alphabet.

What every student of the Landmine Impact Survey may want to understand is the fact that the livelihood and institutional blockage component of the impact score is not "proportionate to the length of the text". Rather, it is proportionate, in a loose manner of speaking, to the scope of the alphabet. The number of different types, not the number of tokens, is what counts.

That particular metric, of course, is open to objections, as several critics have pointed out. If, for example, a farmer finds one mine in a corner of his orchard yet is still perfectly able to harvest the other 95 per cent of his fruit trees, his discovery will make the same contribution to the overall score as would happen if mines put out of operation the entire non-irrigated crop land in his community. In other words, the index is way too sensitive at the low-intensity end of mine infestation, and is very dull at the high end. It is not well calibrated.

Two considerations attenuate for the absence of proper calibration. First, within the limits of efficient and reliable data collection during most Landmine Impact Surveys, there is no way to define meaningful units for the occurrence of mine effects other than persons hurt. An exception may be made for fairly homogenous societies with long-standing mine action programmes, such as irrigation-based rural Cambodia, where data on inaccessible farm area may be readily available. In general,

[2] The IMSMA is a sophisticated GIS-based database that has been developed by the GICHD on behalf of the United Nations.

however, the information economics of the Landmine Impact Survey will forbid stronger metrics.

Second, societies learn. The hazard from mined cropland, to stay with our example, is not simply the static product of the number of people who depend on farming and of the square metres of unusable land. The ability to develop alternative livelihoods will be a complex function of population size, institutional endowments, and response to previous mine accidents. Thus, even if the mined surfaces were exactly measured, the respective damage to persons and livelihoods would probably be less than proportionate to their actual areas, and more to, say, their square root or to any other of the power functions common in learning models.

In other words, the Mine Impact Score as a largely qualitative measure may be more valid than it would seem at first glance. Its validity, however, will be restricted to the objectives of the Landmine Impact Survey to create a meaningful ranking of communities in terms of mine impact. It will not characterise a community very well for the purposes of a Technical Survey.

This discussion is important because other systems of indicators for mine action will be faced with similar problems. Whatever the system, it will need to define rules for qualities (types of problems) and quantities (counted or measured tokens). It may imply hazard and utility assumptions that are non-linear. It may need rules for connecting statements that are far from obvious. The current Mine Impact Score, however imperfect, illustrates how such a calculus can be implemented. Nor does the Landmine Impact Survey stand alone in its use of weak metrics; the use of softer "presence/absence" type of data is recommended in many situations where "high quality ... quantitative data [is] expensive, intrusive, or otherwise impractical to obtain" (Orwin et al., 1998:246). Figure 3 (page 32) offers an illustration of how enumerators collect data in the field for the Mine Impact Score.

Compassion

This discussion so far has been technical. Given that the Mine Impact Score takes more than 10 substantively different arguments, this is understandable. But the technicalities are less important than the basic intent of the impact score, which is to arouse and inform human compassion. The impact score signals those communities which have, by several standards, suffered greatly from mines and elevates these communities for priority attention of the mine action community. The working assumption is that communities scoring high on this index are also the ones in which mine action has a greater potential for reducing future suffering.

The symmetry between past actuality and future potential is, of course, not unique to the Mine Impact Score, and is key to the functioning of a number of organised systems of social memory. Educational testing, credit rating, codification of styles in art and science come to mind, among others (Luhmann, 1996:319ff.).

Commonly, such systems display two important characteristics. First, they accept a measure of oscillation, such as in a series of good and bad school marks in the same student, or between the score of the Landmine Impact Survey and the new insights that later mine action contacts with the same communities may produce — in other words, they demand a good, but not too high, predictive validity.

Figure 3: An Intuitive Approach to the Mine Impact Score

Some readers may find it easier to understand the score when they look over the shoulders of enumerators who do the actual figuring in the field. Enumerators use forms like the one below. In the weights columns, weights will have been defined for them, on a country-specific basis, for the ten institutional and livelihood areas enumerated. Later, the scores will be recalculated in the database.

Locality identifier: District: Community:

Indicators		Weights	Points to add	Score
The community reported that				
• there were mines.	If so, give	2 points	_____	
• there was UXO	If so, give	1 point	_____	
		Subtotal for explosives realm:		_____
• access to some irrigated crop land was blocked.	If so, give		points _____	
• access to some rainfed crop land was blocked.	If so, give		points _____	
• access to some fixed pasture was blocked.	If so, give		points _____	
• access to some migratory pasture was blocked.	If so, give		points _____	
• access to some drinking water points was blocked.	If so, give		points _____	
• access to some water points for other uses was blocked.	If so, give		points _____	
• access to some non-cultivated area was blocked.	If so, give		points _____	
• access to some housing area was blocked.	If so, give		points _____	
• some roads were blocked.	If so, give		points _____	
• access to some other infrastructure was blocked.	If so, give		points _____	
Total number of points (sum of weights) to be equal to		10 points		
			Subtotal for socio-economic realm	_____
• there were ____ mine victims in the last 24 months.	Multiply with 2 points for victims		_____	
	Points for victims			_____
		Total mine impact score:		_____

If the impact score is 0, rank the community as having **"no known mine problem"**
If the score is between 1 and 5, the impact is considered to be **"low"**.
If the score is between 6 and 10, the impact is considered to be **"medium"**.
If the score is higher than 10, the impact is considered **"high"**. _____

Impact ranking: _____

Secondly, they need to be able to portray history as a kind of living present into which future actions and outcomes can be integrated. At a deeper philosophical level, it is probably this factor which, more than others, bred disappointment with the old generation of general mine surveys, prior to the socio-economic perspective. What is unique to the Survey is the interpretation of the future potential in terms of human suffering and its reduction — as opposed to specific numeric expressions in terms of recovered production, saved lives, or development funds disbursed.

The compassionate character of the Mine Impact Score may be a blessing in disguise. The weak metric makes it nearly impossible to place a value on human lives and therefore does not open arguments between proponents of accident prevention and those who prefer livelihood rehabilitation. Imagine a different survey that uses a stronger metric in the form of cost-benefit analysis. In some rural communities, high-value irrigated farms may have known few victims for considerable time, simply because previous accidents due to intense movements discerned danger areas precisely. On the other hand, women collecting firewood from vast tracts of low-value shrub land may keep stepping on mines with shocking frequency. Given a limited budget for demining, assumed costs of demining and net present values for different types of land, and failure to develop alternative household energy sources, the cost-benefit analysis will imply a trade-off between capital investment and human lives. The metric of the Landmine Impact Survey avoids, or at least postpones, such thorny debates.

Communities as basic units of the Survey

The case for community-level Indicators

It could be argued that a description using only individuals and mined areas could do the landmines problem better justice than a community-based survey does. In such an arrangement, communities would at best provide convenient addresses for victims, survivors, landowners and perhaps other sets of interested persons, as well as for the mined areas. Surveyors would not have to bother about the nature and boundaries of communities, or about the effects that mined areas have on people other than the most palpably afflicted individuals. Philosophically, an individual-based description might be more in tune with modern times. Images of survivors with a personal identity tell the strongest stories, and on-site mine action requires the identification of individuals for such things as medical aid and land ownership. Within given communities, not all individuals are equally affected, and differential impact may be more finely characterised in terms of social status than by inclusion in a community with a summary impact score.

There are several reasons why a community-based description and analysis should be pursued. Most powerfully, the mine action community depends on estimates of the affected population. At the required level of aggregation, it is difficult to see how this figure could be established other than as the population of all the affected communities. The total may be broken down by communities of greater or lesser impact, but the need for some global figures will not go away.

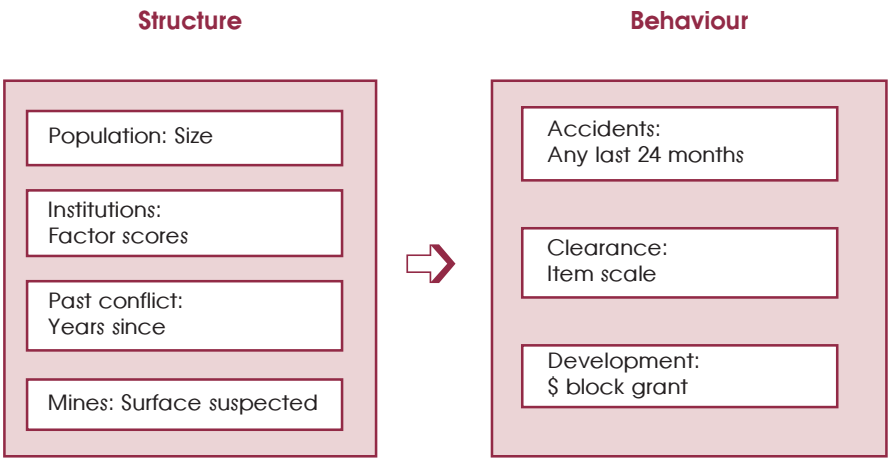
Less obvious is the fact that communities are actors who solve problems of individuals living with mines. Despite dependency on outside markets and bureaucracies, individuals and families survive, by and large, thanks to institutions that are controlled by their local community. The nature and strength of these institutions, and their

measurement within the limits of key informant interviews, should therefore be of concern to the Landmine Impact Survey.

Moreover, the relationships that exist between the community characteristics and behaviours toward landmines form a background on which it may be easier to validate the Mine Impact Score. For example, do the scores for the affected communities show a similar distribution to the one that we find for the probabilities of mine accidents? Would it be similar to the one for local demining effort if we could construct an index for this, proving that severe impact goes together with extreme risk-taking in order to open more roads and lands? Would a similar correlation be established between the impact score and the amount of approved development budgets that cannot be spent because of mine problems?

Figure 4 exemplifies a possible "structure drives behaviour" model. In each box, concepts are not complete, but some are given as examples, together with a possible metric. Note that the Mine Impact Score is not part of this diagram; it is not a member of either the structural or behavioural sets, but is a hybrid formed of elements of both. Its validation will therefore remain difficult and, in many contexts, probably inconclusive.

Figure 4: A Model of Structure and Behaviour in Mine-Affected Communities



Community-level factors: The example of Yemen

Such questions were investigated, in a small measure, in the Yemen survey. The leading hypothesis was that the probability of mine accidents did not only depend on the number of mines and the size of population living near them. The risk would be reduced by the amount of time the communities had had to adapt to the local contamination and by the strength of the institutional endowment. Unfortunately (for reasons of survey design, not of data collection performance), not enough good data was available on other behavioural variables, such as local demining effort or impaired development spending. Therefore it was not possible to build parallel models for cross-validation.

For the accident model, the following concepts were used and measured, with data available for almost all of the 592 affected communities:

Concepts	Associated variables
Pressure on resources:	Size of population Access to water bodies blocked
Intensity of past conflict:	Contaminated area Distance of nearest mined area to centre of community Years since mines last laid Distance to nearest (other) community with some recent mine victims
Institutional endowment:	Degree of institutional modernisation Degree of technical modernisation

"Distance of nearest mined area to centre of community" was discarded because it was difficult to interpret in the case of dispersed village communities. "Years since mines last laid", too was left out in order to reduce the number of variables in the regression model. The two institutional modernisation variables are ex-post interpretations of a factor pattern.

Of further note is the fact that the conduct of armed conflict in the region is less straightforward in its influence on the local ability to avoid mine accidents. The basic idea is that the intensity of conflict is spatially concentrated, and that this extends to the density of mining or UXO littering. Therefore, if the accidents in this community and in this period are only one sample realisation of the local hazard, the accidents in neighbouring communities are significant covariates of the local hazard, too. This measure may be proxied by the distance to the nearest other community with recent mine victims.

Turning to the subject of institutional endowment of surveyed communities, in Yemen eight indicators were used:

- Is the community an ordinary village, or is it the centre of a higher administrative tier (sub-district or upward)?
- Does the community have a primary school?
- Does the community have a secondary school?
- Does the community have a health care facility?
- Is the community connected to a telephone service?
- Do at least some of the households have access to piped water supply?
- Do at least some of the households have electricity?

The selection of those indicators followed predefined fields in the database rather than a theoretical framework already validated in other community studies, but the indicators were thought to be sufficiently diverse at least for an exploratory analysis. This was done using principal component analysis (See below: *The Institutional Endowment of Mine-Affected Communities*).

The Institutional Endowment of Mine-Affected Communities			
Variable	Communities with	Rotated component matrix Institutional	Technical
Has secondary school	15%	.75	.09
Is ordinary village	90%	-.72	-.10
Has health care facility	17%	.69	.21
Has primary school	56%	.59	.06
Fuel is available	11%	.47	.47
Has telephone service	9%	.21	.66
Has piped water supply	19%	.06	.76
Has electricity	24%	.06	.80
Variance explained		36%	16%
Correlation with log of current population		.48	.32

Note that "fuel" loads equally strong on both factors. It is shown under the institutional factors for mere conventional reasons.

The results regarding recent accidents and numbers of victims are fascinating:

- Mine-affected communities are subject to two distinct regimes. One set of factors determines whether a community has any mine accidents at all. A different set of factors determines, for communities that do suffer accidents, whether they have more or fewer victims. Blocked access to water is a common factor of both regimes.
- The strongest influence for being totally accident-free is exerted by the regional conflict history. In other words, the risk of new accidents increases considerably if neighbouring communities too have suffered mine accidents.
- The technical modernisation factor and the access to water bodies come second and third in the power to avoid accidents.
- In communities that do have mine accidents, the size of population, the contaminated surface, and the distance to the nearest mined area are all positively associated with the number of victims.
- However, this is far less disturbing than the finding that the degree of institutional modernity is of influence neither for being without accidents at all nor for the number of victims. This is a slap in the face of conventional wisdom. It suggests that the presence of government personnel does not enhance the communities' problem-solving capacity in the case of landmines.

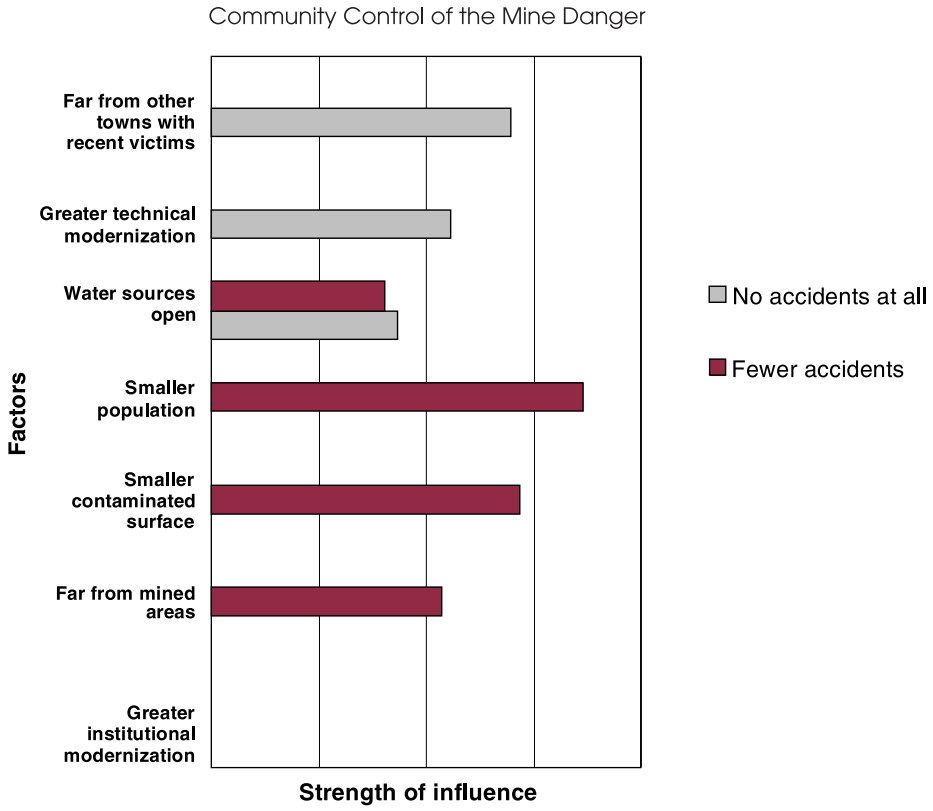
Figure 5 visualises the proportional influence of these factors for each regime: total avoidance of accidents, and number of victims.

On the practical side, the results suggest the need to carefully investigate several policy and practical consequences: the need to take technical survey resources not only to communities classified as highly-impacted, but also to their neighbours; higher weights for blocked access to water, and the creation of alternative employment via technical investment rather than full-scale demining.

For the discussion of socio-economic indicators, one other result seems noteworthy: the distributions of the estimated probability for a community to have at least one mine accident in a two-year period (Figure 6) and of the Mine Impact Score are both

heavily left-skewed, in spite of the fact that the two measures are largely independent of each other. This would lend credence to the validity of the Mine Impact Score as a realistic measure of the harm reduction potential.

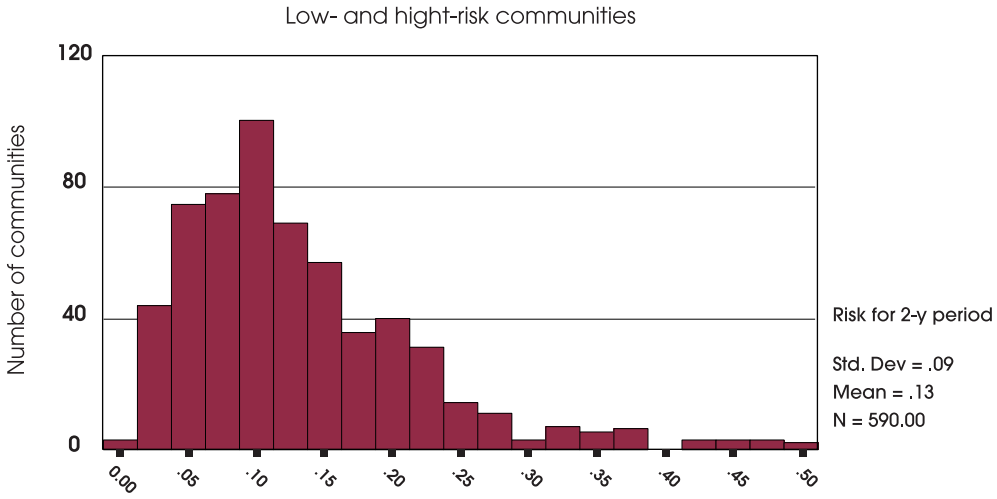
Figure 5: Strength of Community and Conflict Background Variables, Yemen



Through this kind of analysis, the Yemen survey also vindicates the possibility of a structural sociology of landmine-infested communities. Some may want to place such an effort in some more sophisticated framework, such as the neo-Durkheimian trinity of differentiation, pluralism and solidarity (as Frank W. Young has done in his life-long study of small communities; Young and Young, 1973; and Young, 1999). Others will prefer to travel without much theoretical baggage. The choice is a matter primarily of taste, data availability, and the tolerance of practitioners for "socio-speak". The Landmine Impact Survey design has been content to seek basic information with which to characterise the institutional endowment, and therefore local problem-solving capacity, of the affected communities. However, it is difficult to see how in the long run the Global Landmine Survey can build bridges to development co-operation and programme evaluation without validated indicators that speak understandably to those foreign worlds.

More theoretical development seems necessary, perhaps on the lines of some of the community behaviour work done in rural sociology, notably O'Brien on outside network influences (1991) and Zekeri (Zekeri et al., 1994) on the connection of past

Figure 6: Probabilities for Communities to Have Mine Accidents[3]



history and development efforts. The latter works with confirmatory factor models that should be explored for models of mine-affected community behaviour and for indicator design to supply the relevant data.

Non-communities: The "work-around" in Kosovo

Communities as social groups capable of self-description are key to the Landmine Impact Survey methodology. But they are not available in all situations. In Kosovo, immediately after the return of the refugees in mid-1999, foreign military and relief organisations knew more about landmine and UXO contamination than did the population of Kosovo. Also, many returnees and other citizens stayed in temporary quarters away from their former communities. Truly knowledgeable local key informants were rare.

Essentially, communities were not investigated through key informant interviews, not only because of time and information constraints, but also because of conceptual problems. In a province with a history of violent opposition between state and ethnic groups, an authoritative list of communities with which local people — supposing they still lived there — would identify was not available.

That social baseline was replaced by physical data on settlements, roads and land use, chiefly extracted from satellite imagery, and by data on the lowest administrative tier for which polygon shapes and (incomplete) population estimates were available. In Kosovo, these were over 300 units known as districts.

As a result, the analysis that served mine action priority setting relied heavily on spatial constructs. Priority rankings were worked out for two kinds of entity:

- Suspected areas for area reduction and clearance, and
- Districts for mine awareness education.

[3] Based on a logistic regression model.

The metrics used were stronger than those of the Mine Impact Score in a normal Landmine Impact Survey. For the classification of districts, the percentage of contaminated land was used. For the suspected areas, the score used was a composite index, with a weaker metric, but the validation of its components relied on strong metrics. Not all of the validations were straightforward, however, and more precise measurement did not always mean that the concepts were easier to understand (see Messick, 2000).

The scoring variables themselves, and their validation correlates, depended on remote and unobtrusive measurement, at least until the results of aggressive area reduction through community visits were worked in. No emanation from the post-conflict society influenced the data and the analysis, except for awareness education sites, accident locations, incomplete district population updates, and post-return incident and suspected area reports. Notably, no systematic and useful data on types of mine impacts was available other than those inferred from distance to settlements and roads, and from land use.

Initially, the data on suspected areas and on accident locations was of modest reliability, but this improved with the increasing visits made by organisations in different branches of mine action to the communities. These improvements were not accompanied by significant acquisition of social data, notably because sector-specific relief and reconstruction agencies did not have relevant data or failed to translate it to a common reference.

The Kosovo survey attained its objective of providing decision tools for mine action, and it did so within useful time, creatively exploiting a limited gamut of data. Some of the spatially defined data, such as land use, was ready only after several months of astute inter-agency diplomacy. During the same period, other data would slowly improve in reliability and completeness.

The point is, however, that despite stronger metrics to begin with, and improved reliability over time, very small gains were made in validity and sophistication of the underlying socio-economic model. Such gains can hardly be expected from a survey that cannot harness enough knowledge from the affected populations themselves.

That was not a major problem in Kosovo, where mine action resources were plentiful to reprioritise specific interventions when new information became available (such as about communities with fresh accidents). Similar situations, however, can occur elsewhere. As in Kosovo, unobtrusive measurement of physical variables may be more rapid or cost-effective than interviewing local residents. One can speculate that this will increasingly happen if and when aerial detection technologies become available.

A related, less readily manageable scenario arises when mined areas are very large, with each of them able to affect several communities. The physical characteristics of such areas may be relatively well known, but the attribution of impacts, either to the individual mined area based on what it does to a plurality of communities, or to the individual community, which shares the same resources with many neighbours, may be challenging. Such seems to be the case, for example, in the border area between Thailand and Cambodia. In principle, a dual approach should be feasible: a survey of communities each rated by the normal score (multiple counts of the same mined area do not disturb this process), as well as a scoring of mined areas, using spatial metrics and population weighting. The logic for this has not yet been created.

Concluding remarks

The Landmine Impact Survey as part of the Global Landmine Survey has moved from design to testing and to data collection in several countries. The survey has been completed in Yemen, and, in a modified format, in Kosovo. Several other surveys are under way, each demanding and making an amount of conceptual adjustments while trying to stay faithful to the core requirements. The relevant organisational environment, too, is evolving, and in this co-evolution the survey design is not above challenge even at a time when the first complete surveys garnered international applause.

The core logic of the Landmine Impact Survey, and the one "hard-wired" into the database, uses a weak metric to assess degrees of mine problem severity. The weak metric is part of the price paid for a community-centred approach. It allows the calculation of a Mine Impact Score that is both a qualitative and compassionate construct. Also, it keeps information costs down during this phase. It can inform a community ranking for priority mine action, but within this selection special surveys may be needed subsequently for victim assistance needs or for the selection of specific area for clearance considering costs and benefits.

The weak-metric approach is easy to criticise, but difficult to replace. Elements have been injected into the survey format that threaten mission creep and hybridisation while improving the commonality with some of the mine action professions. The international survey management will need to keep a good balance between stability and improvement of a standard design on the one hand, and openness and creativity on the other.

Alternative indicator systems to the one used in the Landmine Impact Survey are perfectly conceivable. Whatever their logic and metrics, the fundamental challenges will remain similar. There is painfully little valid theory around of the behaviour of mine-affected communities on which to ground conceptual frameworks and indicator systems. The Yemen survey has proven that advances are possible. Nevertheless, the challenges of relevancy, validity and reliability will remain omnipresent. The unit costs in a particular line of surveys will go down with replications in more countries, but new needs may also come up for sequential products. New efforts will be needed, not only for technical information, but more so to keep the flame of compassion burning.

Chapter 3

Socio-economic analysis of mine action

With the transition from open conflict to sustained peace, mine action programmes are challenged to extend their focus from risk reduction alone to contributing to the broader goals of national socio-economic development. This chapter illustrates how cost-benefit approaches can be used to assess mine action programmes. Based on case studies of Lao PDR and Mozambique, it demonstrates how such analysis can inform mine action programme managers and policy-makers — in two countries at similar levels of development but with quite different social, economic and cultural characteristics.

Introduction

In brief, economic analysis is concerned with decisions. Some of these relate directly to the use of scarce resources and entail an evaluation or comparison of:

- The costs and benefits expected to arise from deciding on one course of action (is the decision justifiable in any sense?); ***and,***
- The different sets of expected costs and benefits arising from alternative courses of action (is the decision justifiable when compared to other feasible alternatives?).

As such, economic analysis applies certain techniques (to ensure logic and consistency) to selected information and evaluates the results. However, economic analysis is also concerned with a broader set of decisions relating to:

- What is to be valued (the information basis, including whose information counts); ***and,***
- How it is to be valued (the evaluative framework)?[1]

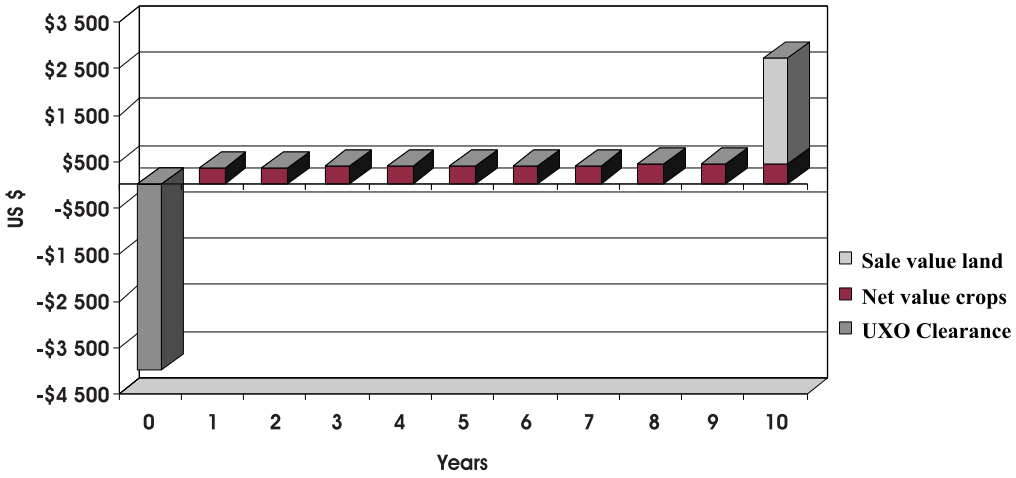
These underlying decisions or value judgements are often implicit or hidden. One of the most important benefits of thorough economic analysis is that it often brings into the open the value judgements that policy- and decision-makers are making implicitly.

[1] Those interested in these broader aspects — economics as a "worldly philosophy" — can refer to books by two recent Nobel laureates: Sen (1999) and North (1990). See also the section *The Mine Impact Score as a compassionate measure* in Chapter 2, p. 28.

Cost-benefit analysis[2]

Consider a simple example of the type of decision that a UXO LAO manager might face. She has been requested to clear some land for "wet season" rice paddies. Based on UXO survey information and on unit cost data from headquarters, she estimates it will cost about US$4,000 per hectare to clear the land. Based on information obtained by headquarters, she also knows the average yield per hectare should be worth about US$370 to the farmer next year, and that this will rise on average by over 2 per cent per year thereafter. Good rice land is a valuable asset in Lao PDR. Although such land is rarely sold, headquarters has developed a formula for "imputing" the sale value of land. With this information, the manager could prepare the following chart (Figure 7) depicting the likely economic costs and benefits relating to the clearance of one hectare of land over the coming ten years.

Figure 7: Simple Cost-Benefit Example



Is the UXO clearance justified on economic grounds?

In this example, simply adding the figures gives a total economic benefit of over US$6,350.[3] Costs will be only US$4,000, but these must be incurred today, while the benefits are spread over the coming 10 years. Might not the farmer be better off if he was simply given US$4,000 today to put in the bank to earn interest over the coming ten years?[4] The answer to this question depends, of course, on the interest rate available on bank deposits and it turns out in this example that, if the expected interest rate is over 6.95 per cent, the farmer would be better off with the money than the land.

Discounting

Making an economic comparison between costs and benefits that will arise in the future requires "discounting" to convert future values into "present values" (see

[2] This section uses data from Lao PDR and the study of UXO LAO – the Mine Action Centre (MAC) in that country.
[3] About 64 per cent of this is from the rice produced and 36 per cent from the value of the land.
[4] If UXO LAO's ultimate objective was to increase incomes of poor farm households, ***in theory*** it could do this by spending money on UXO clearance or, alternatively, by giving the money directly to the poor households.

Box 3: Discounting and the Time-Value of Money). The basic formula used is PV = FV/(1 + r)^y, where: PV = present value, FV = future value, r = annual discount rate, and y = number of years.

Box 3: Discounting and the Time-Value of Money

If given a choice between receiving money today and the same amount sometime in the future, people typically choose to take the money immediately. This phenomenon is termed the "time-value of money", but it holds more generally for any "good" or benefit: most chocolate-lovers will choose chocolate today over the promise of the same chocolate in a month. Similarly, most people will want to delay a cost (or a "bad"). Put in other words, people "discount" the value of future benefits. The "rate of discount" is calculated by seeing how much more of the future benefit a person would demand to exchange it for the benefit today.

For example, if a person would be just willing to exchange US$100 today for US$110 a year from now, her annual discount rate is 10 per cent, and the calculation is US$100 x (1.10) = US $110. The equivalent amount in two years would be US$100 x (1.10)^2 = US$121, and the general formula is FV = PV x (1 + r)^y, where:

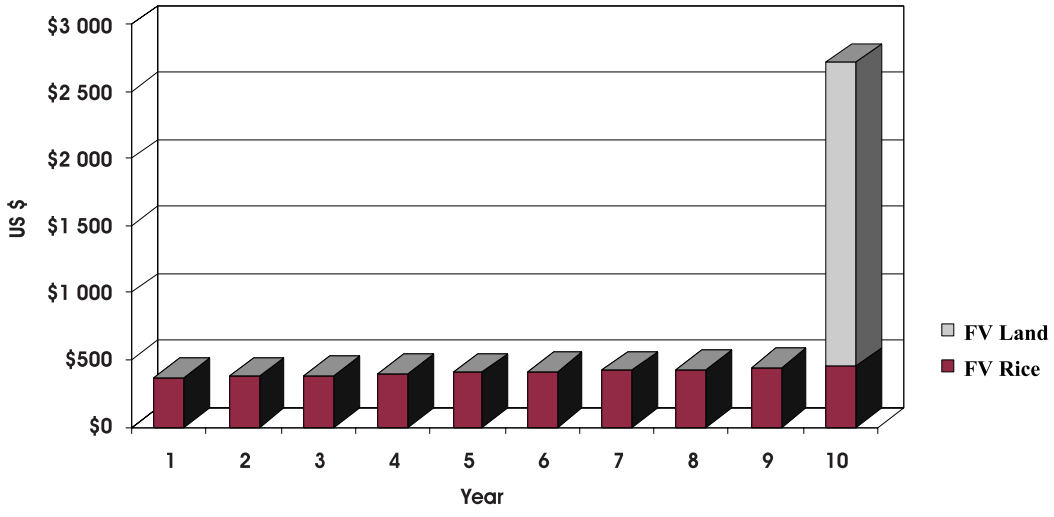
FV = future value PV = present value
r = annual discount rate y = number of years

This is equivalent to the basic formula for discounting a future value to calculate the present value:

$$PV = FV/(1 + r)^y$$

Figure 8 depicts the stream of future benefits (both rice produced and the imputed sale value of the land) before discounting, while Figure 9 (page 44) compares the future and present (discounted) values of the rice produced.

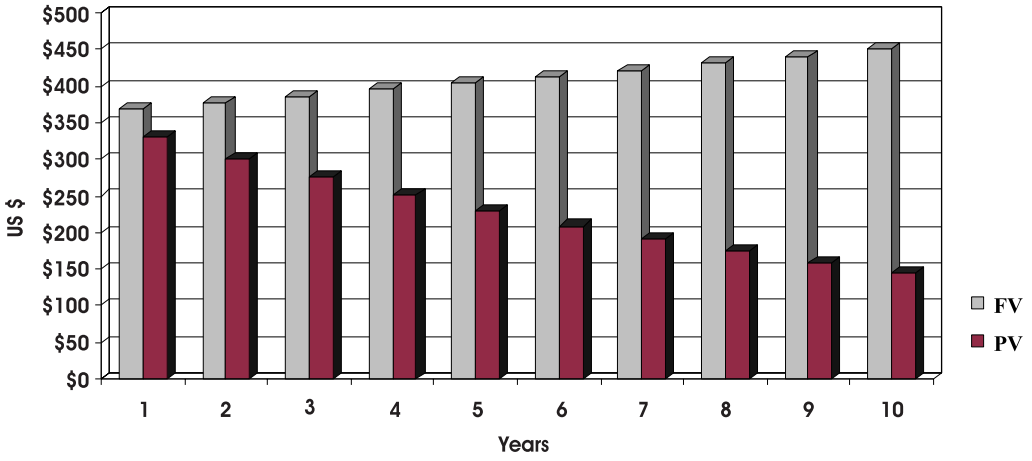
Figure 8: Future Values of Crops and Land



Building a useful model: Key parameters

A very simple model is useful for explaining basic cost-benefit concepts, but even the simple "rice economy" in Lao PDR is more complicated, and it is important to understand its features to ensure the model can usefully (and safely!) serve as a tool

Figure 9: Comparing Present and Future Values of Crop



for decision-making. The key features of the rural economy is Lao PDR are:

- Almost all rural households farm, and the vast majority of these grow rice;
- Land is allocated to households by the community authorities. While most farmers have "ownership-like" control over their land, households cannot generally buy or sell land. Therefore, there is no market for agricultural land, and land values cannot be gleaned from market prices;
- Rice yields vary by farming system, as follows:

Farming system	Average yield per hectare (1997)	Annual growth in yield per hectare (1985-97)
Rain-fed "wet-season" rice	2.9 tons	1.47%
Irrigated "dry season" rice[5]	4.0 tons	4.20%
Upland (sloping land) rice	1.6 tons	1.48%
Overall (weighted average)	2.7 tons	2.45%

- The average farm-gate[6] price for rice was US$177.10 per ton in 1997.
- Farmers save some of their crop to use as seed the following year, and there are spoilage losses during storage;
- Use of improved seeds, fertiliser, and other modern inputs is low, but rising quickly in the Mekong corridor (where there is little UXO contamination);
- The minimum acceptable economic "internal rate of return" (see Box 4: Net Present Value and the Internal Rate of Return) used by the Asian Development Bank for its projects is 12 per cent per annum. This is an appropriate, albeit conservative, discount rate;
- Many rural households do not have enough arable land, so household members spend a significant amount of time on non-agricultural pursuits, including hunting;
- The rural agricultural wage rate is about US$1 per day, but few opportunities for wage work exist in rural areas except during seasonal planting and harvesting peaks (i.e., when farmers are fully engaged on their own land).

[5] The yield figure for irrigated land is for the dry season irrigated crop only. Farmers might also plant rain-fed wet season crop on the same land.

[6] This refers to the price actually paid to farmers, which is much lower than the price in shops due to transport, processing, and marketing costs.

Box 4: Net Present Value (NPV) and the Internal Rate of Return (IRR)

The NPV is simply the present value of benefits minus the present value of costs. The basic formula for any one future year is $\mathbf{NPV_y = (B_y - C_y)/(1 + r)^y}$, where ...

NPV_y = NPV for year "y"

B_y = Value of benefits in year "y"

C_y = Costs in year "y"

The symbol Σ is often used as shorthand to indicate the calculation is repeated (in this case, done for each year) and the results are added together. Therefore, the full formula is

$$\Sigma\ \mathbf{NPV_y} = \Sigma\ \mathbf{(B_y - C_y)/(1 + r)^y}.$$

The IRR is the discount rate that would have to prevail for the NPV to equal zero (i.e., for the present value of the stream of benefits to equal the present value of the stream of costs). A high IRR indicates a good investment.

Based on the above, our "baseline" cost-benefit model will use the following eight parameters[7] to calculate the PV of benefits:

1. Farming system/crop: lowland wet season rice
2. Yield: 2.9 tons per hectare
3. Growth in average yield per hectare: 2 per cent per annum
4. Less: inputs and spoilage losses: 20 per cent of production
5. Price: US$177.10 per ton
6. Number of future years: 20
7. Discount rate: 12 per cent

The above yields an interim figure — the NPV of the next 20 years of rice production on a hectare of cleared land. This is US$3,545.37. We will use this amount as the imputed sale value of the land 20 years hence.[8]

8. Imputed sale value of land: PV benefits = US$3,545.37

For costs, we have two items: the cost of UXO clearance itself, and the value of the extra household labour that will be required to farm the cleared land. For the latter, the new land only provides economic benefit if a farm household spends time clearing it of vegetation, planting, tending, and harvesting. This means household members will not have as much time available for other activities, including hunting, tending livestock, fishing/aquaculture, gathering firewood/making charcoal, weaving, etc. Such activities bring economic benefits, which the household will lose if it cultivates more land.

Wet season rice cultivation lasts about five months, farm households cultivate about 1.6 hectares on average, and the rural daily wage rate is about US$1 per day. Assuming the new land is allocated to "land-poor" households that now have only 0.6 to 1.0

[7] We have not included the value of livestock production in this model, because UXO does not impose significant risks for grazing, and Lao farmers graze stock on rice lands after harvest so no significant grazing land is lost as rice fields are expanded. Livestock is an important issue for land mine clearance in countries such as Afghanistan. The *Socio-Economic Impact Study for Afghanistan* (Mine Clearance Planning Agency, 1999) found milk and meat from livestock was the most significant economic benefit from mine clearance.

[8] One generally must be very careful not to double count various costs and benefits, but this example does not imply double counting. Rather, the sale price for land to be used for agricultural purposes will be based on the expected profits from the land's future crops. Past profits would be a good predictor of future profits, so we are simply using a measure of past profitability to establish a "guesstimate" for the land value. Any reasonable figure would do — the advantage of this one is that it is already generated by the model and no additional calculations are required.

hectares, this suggests an extra hectare would take about half a farmer's time over about 100 days, so 1/2 x 100 days x US$1/day = US$50 opportunity cost of labour per hectare per year.

Before UXO clearance costs are considered, the NPV result for the baseline model is equal to US$3,539.43, implying that clearance costs averaging US$3,540 per hectare would be justified on economic grounds alone.

Preliminary cost studies commissioned by UXO LAO indicate its average unit cost[9] in 1999 to clear a hectare of land was between US$4,000 and US$4,400.[10] This is projected to fall to perhaps US$3,000 for the year 2000 due to higher productivity. These various clearance cost figures give the following results:

UXO clearance	NPV before clearance	Final NPV[11]	IRR[12]
US$3,000	US$3,540	US$540	14.2%
US$4,000	US$3,540	(US$460)	10.5%
US$4,400	US$3,540	(US$860)	9.4%

Upland rice land

UXO LAO also clears land for households to grow upland rice. Productivity in terms of yield per acre is significantly lower for upland rice — 1.6 tons per hectare rather than 2.9 tons per hectare. Also, it takes far more labour to grow rice using shifting cultivation practices: slashing existing vegetation, burning biomass (twice), fencing (to keep out cattle), and much more weeding than is required for lowland rice, where flooding the rice paddies controls weeds. Using the lower yield figure and doubling the imputed cost for household labour yields an NPV before UXO clearance costs of only US$1,412, and the following results for the various clearance costs:

UXO clearance	NPV before clearance	Final NPV	IRR
US$3,000	US$1,412	(US$1,588)	4.7%
US$4,000	US$1,412	(US$2,588)	2.4%
US$4,400	US$1,412	(US$2,988)	1.7%

Irrigated land

The yield for irrigated land is significantly higher than for wet season rice as used in our baseline scenario. Because of better water control, average yield per hectare is four tons for the dry season crop alone. But this is the second crop; normally farmers would plant a wet season crop on the same land, growing this without irrigation, so

[9] The unit cost includes direct clearance costs (labour, explosives, fuel, etc.) plus overheads for capital equipment and administration including salaries of Lao managers. It does not include salaries for international personnel, treating these as "start-up and capacity-building costs". We incorporate these costs in the final sections of this chapter.
[10] The higher figure is based on the number of hectares cleared as reported in the UXO LAO study (579). The Work Plan 2000 reports a higher figure for hectares cleared (622), implying a lower cost per hectare.
[11] Discounted at 12 per cent.
[12] The IRR figures indicate what the discount rate would need to be for UXO clearance to be a break-even proposition. Higher rates indicate a better investment.

the total annual yield for the land is 6.9 tons per hectare. Conversely, some arable land is lost to irrigation canals. UXO will need to be cleared from this land as well. Assuming this averages a little over 11 per cent, the average yield per hectare of cleared land (both crop growing and irrigation canals) would be 6.2 tons per hectare.

Farmers using irrigation also make greater use of inputs, which our model captures because we calculate input costs as a percentage of yields. Greater use of modern inputs also means yields are growing faster — say 3 per cent per year rather than 2 per cent. Finally, labour requirements are significantly higher, both for the second crop and to maintain the irrigation canals. We will assume imputed labour costs to be four times higher than the baseline case, or US$200 per annum.

The above adjustments yield an NPV before UXO clearance costs of US$7,524, and the following results for the various clearance costs:

UXO Clearance	NPV before clearance	Final NPV	IRR
US$3,000	US$7,524	US$4,524	27.4%
US$4,000	US$7,524	US$3,524	21.3%
US$4,400	US$7,524	US$3,124	19.7%

Future prospects

The analysis is conducted on the basis of 1999 clearance operations and 1997 rice production and price data (the latest available). The model predicts the same clearing operations would yield higher NPVs in 2000 because (1) clearance costs are dropping as productivity increases, and (2) agricultural productivity is rising.[13] For example, considering only the effect of 2 per cent/annum increases in agricultural productivity, the model projects a hectare of wet season rice land cleared in 2000 will be worth 2.21 per cent more than one cleared in 1999. This effect will grow at compounded rates with rising agricultural productivity, so UXO clearance will look increasingly attractive over time, particularly if UXO LAO can also continue increasing its productivity.

Sensitivity analysis

Cost-benefit and other types of economic analysis are based on models, which are simplifications of reality. Often, important elements are unwittingly left out or the social scientists do not have in-depth knowledge of the real situation and use inappropriate figures. As such, analysts should always be prepared to alter their analysis based on new information. But the cost of monitoring information is high, so it helps to hone in on those items that make a significant difference. Sensitivity analysis is sometimes used to identify the parameters in a model that cause significant changes in the results.

[13] This assumes rice prices will remain constant in real terms (i.e., adjusted for inflation), as will the major UXO LAO cost elements (salaries, equipment, explosives, etc.), or that the two move in parallel. Rice prices tend to fluctuate significantly because of the agricultural protectionism of developed countries. Agricultural productivity also fluctuates from year-to-year because of the weather and pests, so it is important to consider multi-year averages and long-term trends in productivity.

The following table shows changes in the final results as the various parameters are changed (using the baseline case and "medium" clearance costs of US$4,000 per hectare).

Parameter	10% change to …	% change in NPV before clearance costs	Absolute change in IRR (at US $4,000 cost)
Average rice yield per hectare	3.19 tons	+11.1	+1.26%
Average sale price		Same as above	
Productivity increase per year	2.2%/yr	+1.7	+0.2%
Input/spoilage costs	22%	-2.8	-0.32%
Discount rate	13.2%	-9.5	-0.11%
Household labour costs per year	US$55	-1.1	-0.12%

From this, the critical parameters are: first, rice yield and farm-gate price (equal changes to these have the same effect in the model);[14] second, input/spoilage costs; and third, the rate of productivity increase. Changes in yields and prices should, therefore, be monitored.[15]

So What (1)? Analysis for management

While UXO LAO managers should be interested in the sensitivity analysis results concerning what information and trends they should be monitoring, they have no control over things like average crop yields or rice prices. To be truly useful, a model should address some of the typical decisions that managers and policy-makers are required to make — the things they can influence, at least in part.

We have already seen that changes in the cost of UXO clearance are extremely important in determining whether clearing agricultural land will be justified in economic terms (whether measures in NPV or IRR terms). Cost control and staff productivity are, therefore, ***always*** very important for mine/UXO clearance programmes. In Lao PDR, UXO LAO has already taken steps to (1) reduce staff salaries by over 20 per cent and (2) improve its logistics management to control costs and reduce equipment downtime. Plans are also in place to adapt the training programme based on experience to date, which should means new staff will be more productive.

There are other areas in which UXO LAO, and mine action managers in general, have some influence over outcomes. An important area is work planning, including co-ordination with other agencies. A common problem is that land is cleared of UXO with the expectation that it will be farmed in the coming crop year, but for various

[14] Note however that an increase in price would not benefit a farm household if it was entirely in the subsistence economy (i.e., they neither buy nor sell rice) ***unless*** the increase causes it to engage in marketing. As well, an increase in price would be slightly more attractive to a household that does market rice, because no extra labour would be required. Conversely, an increase in yield would require some additional labour in harvesting and processing the crop. To keep the model simple, we have assumed this additional labour is small.

[15] Although the study team could not obtain official figures, the average price of rice seems to have fallen in recent years to an estimated US$135 per ton in 1998 and as low as US$112 per ton in 1999. Prices also vary significantly within Lao PDR, with average prices being highest in the central provinces and lowest in the north (Bourdet, 2000).

reasons[16] it lies fallow. Because of the time value of money, such delays can significantly reduce the economic benefits accruing to UXO clearance. For example, using the baseline case and clearance costs of US$4,000 per hectare, a one-year delay in putting the land to use after clearance will reduce the NPV by US$330 and the IRR by 0.92 per cent. Clearance costs would then need to be below US$3,210 per hectare to justify UXO clearance on economic grounds alone. In general, UXO clearance offers ***contingent benefits*** (i.e., whether potential benefits accrue is contingent on other things happening). As such, co-ordination with other agencies — and with the communities themselves — is critical to increase the likelihood that benefits will accrue as planned.

Mine action managers must also sequence their work over the year. Generally, they consider climatic conditions that complicate transportation to work sites and the effectiveness of certain equipment. However, there is also a seasonal pattern to agriculture. In Lao PDR, land preparation for lowland wet season rice begins about mid-May (with some regional variations), while transplanting from seedbeds is done in late June and early July. Therefore, clearance would need to be completed by late June if the land is to be planted the same year. Conversely, upland rice growing entails land clearance and burning from January through early April, so clearance would have to be completed much earlier if the land is to be used.

In general, mine action managers should factor the seasonal dimensions of the local agricultural economy into their work planning.

So What (2)? Analysis for policy

While economic analysis can help with work planning and day-to-day management decisions, in fact mine action managers do not base decisions on cold financial logic alone. Quite properly, they consider many factors when setting work priorities. Many of these relate to logistics, but some are, broadly, socio-economic (poverty, food security, child safety, etc.) or environmental (e.g., reduction of slash-and-burn practices).

For both effective management and accountability, it is important that the evaluative framework and information basis of decision-makers is made ***explicit*** (See Box 5: *Values, Information and Policies*). Policy decisions and the publication of policy statements serve these purposes, but only to a degree. Acknowledging that trade-offs will be made between, say, maximising the income stream to "society as a whole" and meeting the food security requirements of impoverished households in remote areas does not answer the question: How much weight is given to food security relative to income maximisation? Without answering this question, how can donor governments be sure their taxpayers' money given to mine action is being used in a manner consistent with their country's humanitarian values? How can senior managers in a national mine action programme be sure that the decisions made by implementing partners and provincial co-ordinators reflect the same values and priorities?

[16] Such delays could occur for many reasons, including: the land is not allocated to a farm household; critical inputs (e.g., credit to buy bullocks, seed) are not available at the right time; the government does not complete planned resettlement in time; no agricultural extension services are available to resettled households, who do not know how to grow crops appropriate for their new land; too much food aid is delivered, depressing local food prices and making it unattractive to plant rice.

Box 5: Values, Information and Policies

Decision-making always involves choices, and the choices made depend on what the decision-taker values and the information at his/her disposal. Further, values influence the **information base** in two ways: by determining (1) in part, what information is collected, and (2) the weights placed on different types on information.

Economists and accountants are often criticised for making decisions based purely on financial or "countable" income figures. More generally, there is a danger that "what isn't counted doesn't count" because many decision-makers give full value to quantitative data while discounting qualitative information, which often is of critical importance. However, neither is it acceptable for managers of publicly- funded programmes to discount quantitative data and base decisions on information they value more highly **without making these value judgements explicit**.

In this light, policies can be viewed as serving two main functions — as explicit statements of values, and as a means for allowing decentralisation.

In making values explicit through policy statements, elected officials and senior administrators inform subordinates what information to value, and how. Subordinates can then be expected to make — roughly — the same decision as the senior officials, and can be held to account if they do not.

Such questions will never be fully answered. However, economic analysis, broadened into socio-economic analysis, can help make these value judgements more explicit. For example, in Lao PDR, farmers in flat terrain and close to roads produce higher average yields, for four main reasons:

- Their land is easier to farm, with less labour;
- They have access to modern inputs (high-yielding seed, commercial fertiliser, tractors, etc.);
- They have access to markets, giving them financial incentive to buy modern inputs or invest in water control measures, increase yields, and sell their surplus production;
- They have access to markets supplying "incentive goods" such as televisions and inexpensive textiles, which improve their quality of life.[17]

UXO clearance of flat terrain close to roads is also cheaper. Therefore, economic analysis will show benefit-cost ratios are higher for flat lands close to roads because (1) benefits are higher and (2) costs are lower. High yields and low-cost delivery of public services are both socially desirable outcomes that are captured by economic cost benefit analysis. ***Social cost-benefit analysis*** is sometimes used to modify analytic results by giving ***explicit*** weight to other socially desirable outcomes, in line with explicit policy decisions.

For example, we might distinguish three categories of land, with different yields and UXO clearance costs but holding all other parameters constant, as follows:[18]

Characteristics ⇨	Flat, all-weather road	Flat, dry-season road	Flat, remote
Average yield	3.5 tons per hectare	2.9 tons per hectare	2.5 tons per hectare
Clearance costs	US$3,500	US$4,000	US$4,400
NPV before clearance	US$4,349	US$3,540	US$3,000
IRR	14.9%	10.5%	7.7%

[17] Subsistence farmers must assume extra risk to engage in the market economy. For example, they may have to borrow money to purchase modern inputs, and they may depend on agricultural extension workers — who might not be around when needed — to learn new farming practices. Financial incentives alone are generally not sufficient to entice farmers to accept such risks unless they can also buy things that make life easier and more enjoyable.

[18] The medium "flat, dry-season road" example is our earlier baseline case.

The results obtained by cost-benefit analysis can be modified in three ways: by adjusting the costs, the benefits, or the discount rate. In this example, one simple way of adjusting costs to tilt results in favour of less-advantaged households is to use average UXO clearance costs — in this case, US$4,000 per hectare.[19] This does not alter the NPV before clearance, but changes the IRR results to 13.1 per cent, 10.5 per cent, and 8.7 per cent respectively.[20]

Social cost-benefit analysis typically adjusts the benefits to give extra weight to socially desirable outcomes. In Lao PDR, one of the national development priorities is "increased food production" to achieve food security.[21] UXO LAO could, via a policy decision, give higher value to rice that will be directly consumed by a food-deficit household — typically by multiplying the yield expected from their newly-cleared land by a number greater than 1. The "conversion factor" then makes it explicit how much extra weight we are giving to rice production that contributes to the household food security objective, in addition to the standard economic benefit. For example, if we set the food security conversion factor at 1.25, we are giving 25 per cent more weight to rice that will be directly consumed in a food-deficit household.

Strictly speaking, we should only do this conversion for the portion of future production that is necessary for household food security. The arithmetic is modestly complicated, and we do not want UXO team leaders to do long calculations before making each clearance decision. Accordingly, the calculations can be done at headquarters and summarised on tables or graphs such as the following (for the sequence of calculations, see Box 6: *Calculating Food Security Adjusted Yields*):

Expected yield	Household size (hectares)					
	2	3	4	5	6	7
< 2.40 tons per hectare	Clearance not justified					
2.40 tons per hectare	X	X	X	X	X	Clear
2.47 tons per hectare	X	X	X	X	Clear	Clear
2.56 tons per hectare	X	X	X	Clear	Clear	Clear
2.65 tons per hectare	X	X	Clear	Clear	Clear	Clear
2.74 tons per hectare	X	Clear	Clear	Clear	Clear	Clear
2.82 tons per hectare	Clear	Clear	Clear	Clear	Clear	Clear
> 3.00 tons per hectare	Clearance always justified					

UXO LAO managers could use a similar approach to give greater weight to clearance that would allow slash-and-burn farmers to resettle on flat land to grow rice in less environmentally harmful ways. Once again, the advantage of this approach is that it makes explicit critical value judgements that policy-makers and managers are making anyway. Once these are in the open, they can be debated to ensure, in a more concrete manner, that the policies are consistent with government priorities and donor values, and that subordinates understand and can apply the policies more consistently.

[19] This approach is often used, based on the value judgement that all citizens should have equal access to certain essential public services. For example, Canada Post requires the same stamp on letters from one Toronto address to another as on letters sent 4,000 miles from Toronto to Vancouver.

[20] Note that UXO LAO does not yet have cost accounting systems in place to give different standard costs for different combinations of terrain and road access. In using the overall average clearance cost, it is implicitly favouring beneficiaries in more remote communities.

[21] Food security must be assessed at various levels - national, regional, community, household, and individual - that are inter-related but not the same. Our discussion focuses on household food security.

Box 6: Calculating Food Security Adjusted Yields

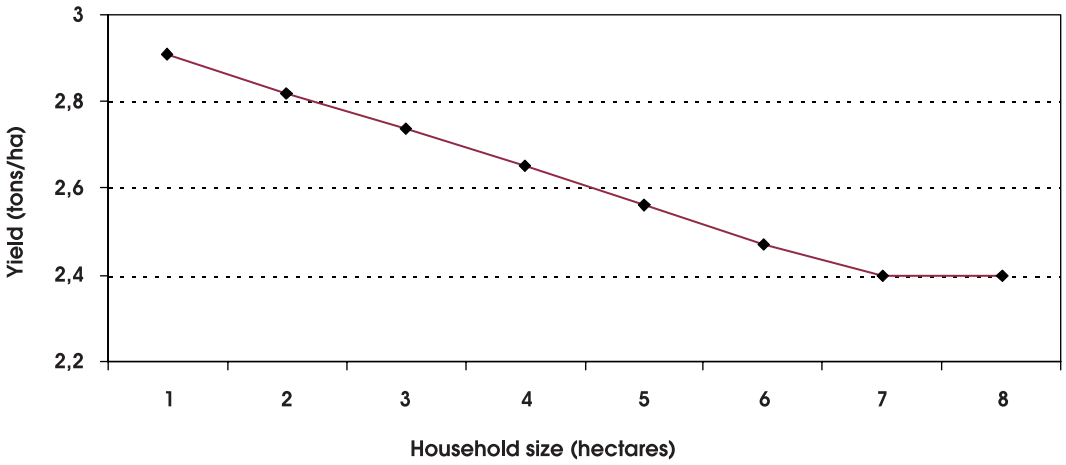
In the example above, we assume UXO clearance will be justified on social and economic terms if the "adjusted" yield promises to be above 3 tons per hectare. Starting with the **expected yield** obtained by the agriculture department or local informants, the adjusted yield is obtained in the following steps:[a]

1. Calculate the **milled rice requirements** by household size.
2. Divide the result by 51 per cent to obtain the equivalent **paddy requirements** (i.e., 49 per cent of paddy rice by volume is lost in storage or milling, or saved as seed);
3. Subtract the paddy requirements from the expected yield to obtain the amount of **surplus paddy**. If the result is negative, use zero;
4. Multiply the paddy requirements by 1.25 (the conversion factor) and the figure obtained for surplus paddy by 1, then add the two results.
5. Multiply the expected yield by 1.25 to obtain the **maximum possible adjusted yield**.
6. Take the lesser of the results from steps 4 and 5 as the **adjusted yield**.

[a] These calculations are for households that presently do not have any land (e.g., resettlers). Information on rice requirements and losses in converting paddy rice to milled rice is from: Government of Lao PDR, Ministry of Agriculture and Forestry, 1999:17, Table 8: Rice Balance Sheet for 1995-2000.

In many situations, such debates will raise other "special cases". Quite often however, debate might show that just about every group is a "special case". Either there is no justifiable reason for privileging one group over others equally impoverished, or the question of equity might best be dealt with by making a explicit policy decision to exclude services to well-defined groups that are relatively well off.[22]

Figure 10: Cut-Off Line for UXO Clearance



[22] In Lao PDR, this might be commercial farmers and/or farmers growing export crops who have more than, say, five hectares. These people might use commercial UXO firms as their decision to expand the cropping area is, essentially, a commercial proposition. Alternatively, UXO LAO could provide services on a cost recovery basis.

Evaluating the entire clearance programme

The models developed allow an assessment of whether to clear a particular area of land in the future. The clearance cost per hectare is a "full-cost" figure including both direct labour, materials, fuel, etc., plus overheads for UXO LAO management, equipment depreciation and maintenance, local training costs, and similar items, based on 1999 cost and productivity figures. However, very significant sums were invested since late 1995 in building UXO LAO's capacity, and in the early years its clearance productivity was far lower. Can we say anything about the likely return on investment to these "start-up and capacity-building costs"?[23]

First, it must be emphasised that these historic costs have already been incurred. Economists refer to these as "sunk costs" and sunk costs should not influence future decisions. Significant capacity in UXO LAO has already been paid for and should be used as the NPV of future benefits promises to exceed that of future costs. The following exercise, therefore, is more relevant for donors when considering how best to establish new programmes in the future for mine contaminated countries.

To evaluate the entire clearance programme in Lao PDR, we need to start from its beginning in 1995 and compare the total costs against the benefits accruing from all clearance operations to this point in time. We then need to forecast total clearance costs and total clearance benefits into the future.

Estimating total clearance costs from 1995

UXO LAO and its implementing partners perform both clearance and risk reduction (roving clearance and community awareness), so total costs must be apportioned among these functions. In 1999, an estimated 62 per cent of field staff time was spent on clearance, with the rest going to risk reduction. Detailed figures are not available for prior years, but we know risk reduction — particularly roving clearance — was given higher priority in earlier years, while there is pressure to shift more resources to clearance in the future. The following table gives our estimates for total costs (including international salaries) plus the percentages allocated to clearance.

	1995	1996	1997	1998	1999	2000 (est.)
Total costs (US$000s)	1,091	4,371	8,206	10,031	10,293	10,615
% Clearance	45	50	55	60	62	64
Clearance costs	491	2,186	4,514	6,019	6,382	6,794

We project total costs will decline over a number of years to US$6 million in 2006 as international staff are withdrawn, and the proportion of total field staff (i.e., deminers and community awareness personnel) allocated to clearance to increase gradually until it reaches 80 per cent.

[23] As well, the cost figures per hectare used earlier do not include the continuing capacity-building costs (i.e., the salaries and benefits of international technical advisors and trainers).

Estimating how many hectares will be cleared

An estimate for total benefits requires (1) the number of hectares cleared and (2) the estimated NPV from the average hectare cleared. For the first item, figures for 1996 to 2000[24] are:

Year and hectares cleared	Index (1996 = 100)	% increase (year-on-year)
1996 – 24	100	
1997 - 159	663	553
1998 - 292	1,217	84
1999 - 578	2,404	98
2000 - 1000 (projection)	4,167	73

We need a projection for the hectares likely to be cleared in future years, but cannot simply extrapolate from earlier years as UXO LAO was growing rapidly from 1995-2000, and this will not continue in the future. Total growth in clearance operations since 1996 stemmed from increases in (1) the number of deminers, (2) the percentage of time each deminer works on clearance (as opposed to roving), and (3) the average productivity of a deminer. For the first two items, we project UXO LAO will stop expanding in 2001 and that it will gradually reallocate from roving to clearance until 86 per cent of total deminers' time is spent on clearance by 2004. But how can we estimate future productivity increases?

As a basis for this, we first need to understand the reasons behind the rapid increase in clearance to date. The following table gives our estimates for three sources of increase.

Source of increase	1997	1998	1999	2000 (est.)
Additional deminers	309%	17%	7%	22%
Reallocation to clearance	8%	8%	7%	4%
Productivity Increase	50%	46%	72%	36%
Total year-on-year increase[25]	563%	84%	98%	73%

About 54 per cent of the total increase in production (i.e., hectares cleared) from 1996 to 2000 is due to expansion of the programme (more deminers), with about 3 per cent due to reallocation of deminers from roving to clearance. A substantial increase in labour productivity[26] (i.e., the number of hectares cleared per deminer working on clearance) accounts for the rest. The pattern of labour productivity growth in the past gives some basis for estimating future productivity growth. Labour productivity increases peaked in 1999.[27] Following the peak (a 72 per cent year-on-year increase), it appears the rate of labour productivity growth will fall by half in 2000. We therefore project future productivity increases will decline by half each year. Based on these assumptions, the number of hectares cleared in future years is depicted in Figure 11.

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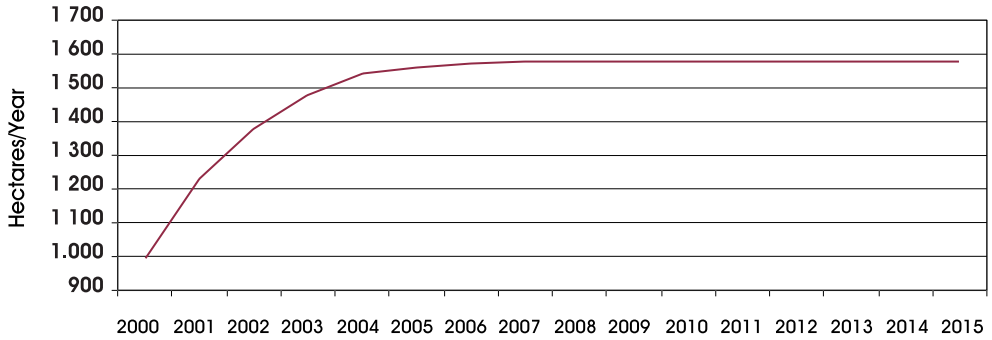
[24] Based on clearance rates for the first four months of 2000 relative to the comparable period in 1999.

[25] Note, these columns do not add to the total — productivity increases are multiplicative. Using 1997 as an example, the formula is Total Increase = (100%+309%) x (100%+8%) x (100%+50%) - 100%. In this case, we know the Total Increase and the increases in both the number of deminers and the reallocation from roving to clearance, so we calculate the productivity increase as a residual.

[26] Note, some of the increase in "labour productivity" may be due to better use of equipment, in which case this term could be called "total factor productivity".

[27] We assume the peak in productivity growth did not occur earlier because managers were new and busy expanding the programme (both numbers of personnel and provinces covered) until late 1998.

Figure 11: Projected Hectares Cleared



Estimating NPV of benefits

We already have developed a model suggesting the NPV of clearing a hectare of rain fed rice land, at a 12 per cent discount rate (the baseline case), was about US$3,540 in 1999. Agricultural productivity is increasing at about 2 per cent per year, so the NPV of clearing the same hectare will be higher next year.[28] This pattern will continue as agricultural productivity increases over time.[29] We also know the NPV of clearing irrigated land is significantly higher, and will increase faster over time because of higher rates of productivity increases. It is hard to estimate average values for other clearance tasks (intensively farmed vegetable plots, roads, schools, health clinics, etc.), but these are likely to be significantly higher on average than that for rain-fed agricultural land.[30]

The basic model

Based on the above discussion, we will use the following parameters to build a model:

- Clearance costs = total costs x percentage attributable to clearance;[31]
- Hectares cleared = actual figures to 1999, then increased by projected changes in numbers of deminers, percentage of deminers' time spent on clearance, and labour productivity increases;
- Labour productivity increases = calculated at 72 per cent for 1999 and projected to decline by half each year thereafter;
- NPV of cleared rain-fed agricultural land = US$3,540 in 1999, adjusted for prior and future years for growth in agricultural productivity (estimated at 2 per cent per year);
- Average NPV of land cleared = 125 per cent of rain-fed agricultural land (as portions of the land cleared will have higher NPVs than rain-fed rice land).

[28] It will increase to almost US$3,620 for 2000.

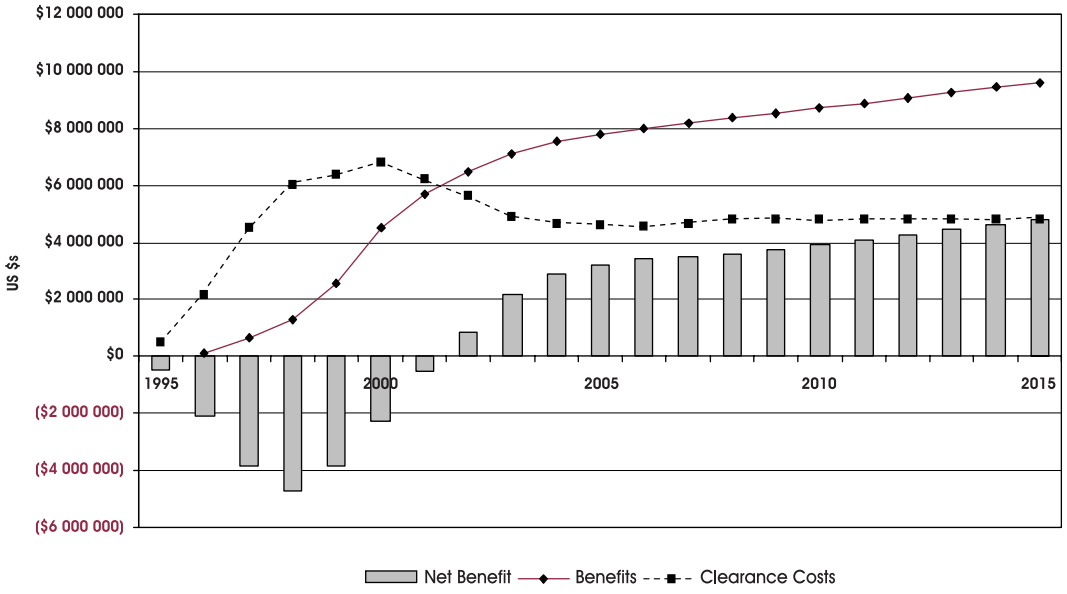
[29] Similarly, the NPV of wet season rice land cleared in earlier years would be slightly lower than in 1999.

[30] For example, the cost of replacing rural roads averages US$30,000/km (World Bank, 1997a:iii). Clearing the entire length of the road to a width of 20 metres means a maximum area clearance of two hectares for every kilometre of road. Bids for this type of clearance range up to US$2,000/ha (because the road is not in fact mined for its entire length). Therefore, total costs of perhaps US$4,000 provide an immediate benefit of US$30,000 — a net benefit of US$26,000 and an IRR (assuming the clearance is done fully six months before the road is reopened) of 5,525 per cent. Even if the road has deteriorated and requires reconstruction at, say, US$15,000/km, the internal rate of return for clearance six months prior to the road reopening would be over 1,300 per cent.

[31] Calculated in this manner, average clearance costs per hectare were about US$11,040 in 1999, rather than the US$4,400 estimated in UXO LAO's *Cost Capture Study* (unpublished). This gives an idea of the scale of how dramatically international salaries and benefits push costs up.

Figure 12 provides a graphical depiction of the result (evaluated to 2015). The clearance programme should begin to generate net benefits in 2002, and these benefits will grow over time with increases in agricultural and labour productivity. It results in an IRR of 9.81 per cent if evaluated from 1995 to 2015, but the IRR increases as the period is extended. For example, the IRR is 12.67 per cent if the model is evaluated to 2025. In addition, no adjustment has been made to compensate for tied-aid costs, which we estimate have reduced the value of capital equipment by almost US$3 million, or 18 per cent of the US$16.65 million in capital equipment provided by donors. Charging this cost directly to donors rather than to UXO LAO increases the IRR to 10.85 per cent (1995-2015) and 13.52 per cent (1995-2025).

Figure 12: Costs and Benefits of UXO Clearance (baseline case)



Based on the assumptions used, the decision to establish UXO LAO in 1995 was certainly defensible on economic grounds, at least with respect to clearance operations, as future benefits will eventually justify the heavy start-up and capacity-building costs.

We must emphasise that, now these "sunk cost" investments in UXO LAO's capacity have been made, the evaluation for future operations alone is far more positive. Evaluating just the period from today to 2020 yields an IRR of almost 54 per cent.[32]

Sensitivity analysis

The above figures are based on multiple assumptions. How sensitive are the results to the various assumptions?

This model is ***very*** sensitive to changes in the assumptions regarding average yields for rice (and the price of rice) and to the ratio of the average net present value of all land cleared to that of rain fed rice land. It is quite sensitive to changes in the assumption

[32] One need not worry that all the clearance will be completed before 2020. The figures used in the model imply about 410 km^2 will have been cleared by 2025. Mines Advisory Group (MAG) has estimated that up to 1,100 km^2 are contaminated in Xieng Khouang province alone.

Parameter	10% decline to …	New IRR (Baseline = 9.81%)	Absolute change in baseline IRR
Average rice yield per hectare	2.64 tons	6.17%	-3.64%
Average sale price of rice		Same as above	
Agricultural productivity increase per year	1.82%/yr	9.39%	-0.42%
Ratio of NPVs (average for all cleared land to rain-fed rice land)	1.14	6.54%	-3.27%
Decline in rate of labour productivity increases.	45% of prior year's increase.	8.28%	-1.53%

for future labour productivity increases.[33] UXO LAO cannot influence agricultural productivity or the price of rice, so the management implications are that it (1) targets its clearance well and (2) keeps experimenting with ways to increase the productivity of clearance without, of course, compromising safety.

In retrospect, it appears the 1995 decision to establish the UXO LAO clearance programme was sound, even when only the economic benefits are considered. Looking ahead, now that UXO LAO has built significant capacity, it should begin to yield significant net economic benefits within the coming few years, assuming it continues to be well managed.

The Case of Mozambique[34]

Mozambique is a large (800,000 km^2 or the size of the United Kingdom (UK) and France combined), sparsely populated country (between 17 and 20 million people, depending on assumptions concerning excess mortality due to HIV/AIDs).[35] With an extremely long (2,470 km) coastline along the Indian Ocean, Mozambique's north-south axis is far longer than its east-west, which complicates transportation from the food-surplus north to the food-deficit south.[36] This was further aggravated by the colonial pattern of investment, which encouraged the export of agricultural raw materials to Portugal rather than an integrated local economy. Except for a few mission schools, Africans did not have access to education, and the mass exodus of Portuguese prior to independence in 1975 left the economy without skilled labour. The commercial network servicing rural areas also collapsed with the departure of Portuguese and Asian merchants, and marketed agricultural production fell 43 per cent in the two years leading to independence. The country's dire economic straits were further complicated by a prolonged civil war, with rebel forces supported first by Rhodesia and later South Africa. When peace was achieved in 1992, Mozambique was perhaps the world's poorest country.

[33] High wage increases would have a similar effect.
[34] Statistics are from a variety of sources including the *World Development Report: 2000-2001* (UNDP, 2000b) and the *CIA Country Factbook* (CIA, 2000).
[35] The national census in August 1997 indicated a population of 16.1 million; about 2.4 million lower than projected. Its population density (22 inhabitants per km^2) is the same as for Lao PDR, but a far higher proportion of its land is cultivable.
[36] As a result, maize prices in the south are sometimes 2.5 times higher than in the north and centre (FAO/WFP, 2000:2).

Mozambique has achieved a remarkable economic turnaround since 1992, with one of the highest growth rates in the world. Still, it remains very poor, with an estimated Gross National Product (GNP) per capita of only US$230 (about US$800 in Purchasing Power Parity, or PPP, terms) in 1999. Its infant and child mortality rates stand at 147 and 219 per thousand live births, and 26 per cent of children under five are moderately or severely malnourished. Life expectancy is estimated at between 38 and 46 years. Sixty per cent of the population is below the food poverty line. Less than a third of people have access to safe water. Mozambique has been ranked 169th of 174 countries on the Human Development Index.

Key social and economic features[37]

Given its size and low population, Mozambique is considered a "land abundant" country. Agriculture is the backbone of the economy and the country's strong growth in recent years has been led by smallholder agriculture.[38] This growth has stemmed from bringing more land under cultivation rather than increasing yields per hectare via more intensive agricultural practices. Agriculture remains characterised by low productivity. Few modern inputs are used and little of the output marketed. And rural areas are ill served by economic and social infrastructure — in 1996-97, the mean distance of rural households to a market was 16 km and to a health clinic 29 km. About 80 per cent of Mozambique's poor live in rural areas, and about 90 per cent of rural adults work in agriculture. Rural areas are also vulnerable to periodic droughts and floods. The devastating floods of February-March 2000 killed 700 people, displaced 250,000, and put up to two million in severe economic difficulty.

On average, Mozambique has sufficient land for its three million households and for further "extensive" growth, but the situation varies significantly across regions. There is little free land remaining in the three southern provinces and local shortages have been created by large land grants to commercial concerns.[39] Many of the largest tracts of available land in the north and west remain unserviced by roads or public services.

Climatic conditions also vary considerably, with the south being drier and more vulnerable to drought. The best soils are also found in the highland areas in the western and northern regions. Because of differences in rainfall and soil, households need different amounts of land for cultivation. The following table summarises data concerning average landholdings, available land, and food insecurity across regions:

Region	Average hectares per household	Ratio: arable to cultivated land	Average months of food insecurity reported
North	2.42	7.19	2.3
Centre	2.35	6.73	3.4
South	3.29	1.15	5.0
Total	2.54	5.60	3.7

Sources: World Bank (1997b:25, 171); de Marrule (1998:113); author's calculations.

[37] This section draws extensively on World Bank (1997b, 2000), Government of Mozambique (1998), and the Economics Research Paper Series published by the Ministry of Agriculture and Michigan State University, <www.aec.msu.edu/agecon/fs2/mozambique/index.htm> (accessed 20 September 2000).
[38] Value added in agriculture and livestock grew at more than 9 per cent per year since 1996.
[39] Confirmed land concessions of over 9 million hectares were reported from 1986-93, with another 1.75

Land poverty and land tenure systems

There also are important cultural differences within the country, with the Zambezi River dividing the patrilineal land tenure systems in the south from the matrilineal north. Indigenous tenure systems have been influenced by Muslim beliefs in coastal areas and by the Portuguese legal system, resulting in a diversity of traditional practices. Customary systems are not recognised in Mozambique land law, which creates insecurity in both the modern and traditional sectors. Subsistence farmers may lose land rights because concessions are given to commercial concerns, but the latter groups often fear reprisals from local groups or arbitrary cancellation of their titles if traditional authorities are able to get official recognition for their traditional claims over the land.

Mine clearance makes more land available for agriculture and other activities. Therefore, it provides significant economic benefits in areas of land scarcity. Given the relative abundance of arable land, most development planners have assumed land poverty is a localised phenomenon in Mozambique (i.e., there are specific areas of general land shortage created by population pressures or land grants to commercial interests). They assumed that, elsewhere, customary land tenure practices would grant usage rights to households that could make use of it. Recent research indicates this may not be true. One study found:

- A significant group of land-poor households in northern Mozambique (Nampula and Cabo Delgado);
- Land inequality throughout the country is similar, and this inequality has changed little since the ending of the war;
- Land holdings are a major determinant of household income. Thus, land poor households face both a serious income shortage and a critical food security problem (de Marrule, 1998:ii).

Most of the observed land poverty is not due to general land scarcity in the area surrounding a community, rather "in proportional terms, 83 per cent of the total variation in land holdings is due to factors within the villages, while 17 per cent is due to factors between villages". An important determining factor seems to be kinship lineage: "those belonging to a "strong" lineage are more likely to get access to more and better land, compared to other households that belong to a lineage considered "weak" (de Marrule, 1998:69).

Food systems

There are a wide variety of farming/food systems in Mozambique. One classification of these gives four principal systems:[40]

- Highlands/Midlands — more than 200 metres above sea level, with better than average rainfall, low likelihood of crop failure, and suitable for most crops (40 per cent of total area);
- Lowland plains and coastal — combination of fishing, crop production, livestock rearing, and trading, with generally good rains (13 per cent);
- Major river basin — good soil fertility and irrigation potential, featuring both food crops and horticulture, plus fishing, but vulnerable to floods (32 per cent);
- Drylands and semi-arid — located mainly in the south, with average rainfall less

million in unconfirmed reports. Assuming half the area is arable, this amounts to over 15 per cent of arable land. World Bank (1997b:173). Kloeck-Jenson (1998:240) reports at least 20 million hectares have been "acquired" via concessions between 1992 and 1994 alone.

[40] Government of Mozambique (1998:9).

than 600 millimetres per year. Food crops are susceptible to drought, and the region generally is in food deficit. Livestock production and employment income (including remittances from migrants to South Africa) is important (15 per cent).

The north generally produces significant food surpluses, the south is normally in deficit, and the centre can be either in surplus or deficit.

Mozambique clearly has a heterogeneous rural economy, and one must be wary of generalisations. Recent efforts to develop cost-effective approaches for monitoring income and nutritional status have had to include 10 sources of household income to capture variations across regions and food systems, as follows:

Percentage of average household income (across 7 zones)		
Income component	Minimum	Maximum
Food crops	18.8%	30.4%
Non-food crops (e.g., cotton)	2.9%	16.9%
Fresh production	1.4%	9.7%
Vegetables (from garden plots)	0.3%	4.3%
Fruit	2.7%	15.6%
Fishing	0.1%	8.1%
Cashew	0.0%	16.9%
Livestock	16.0%	27.5%
Wage labour	5.7%	22.7%
Micro-enterprise income	1.8%	22.6%

Source: Government of Mozambique, MAP/MSU (2000a); author's calculations.

Food crops and livestock are everywhere important, but rural households clearly pursue a variety of strategies to cope with poverty and reduce vulnerability.

Gender issues

Very strong divisions of labour between men and women typically prevail in rural households. For agriculture, men clear land and assist in land preparation for planting, but women plant, tend, harvest and process crops in addition to their heavy familial and household responsibilities (e.g., fetching water and firewood). Where a man has more than one wife, he will establish a farm (*machamba*) for each; essentially, these operate as separate households. Men often migrate within Mozambique or regionally to earn and remit income, and well as hunt or fish[41] to supplement food supplies.

The basic cost-benefit model

Given the varied nature of Mozambique's rural economy, a cost-benefit analysis should consider a range of production values and prices. The following uses data on maize yields and prices for a sample of 210 smallholder farmers in Nampula Province, broken into three different production practices:[42]

- A high-input package (improved open-pollinated maize plus fertiliser);
- Improved planting and weeding practices only (using local seed, without fertiliser);

[41] Women also collect molluscs and shore fish, but these have little commercial value in Mozambique. (Government of Mozambique, 1998:26)

[42] Data in this section comes from Government of Mozambique, MAP/MSU (2000b).

- A control group of farmers using traditional practices (no improved seed or fertiliser).

These resulted in different average yields, and required different amounts of household and hired labour, as follows:

	High Input	Improved Practices	Traditional
Average yield (kg/ha)	2,700	1,950	1,247
Household labour days	108	108	116
Wage labour days	60	60	0

While total grain production has expanded at 12 per cent per year in Mozambique (1990-98), most of the increase has come from bringing more land into production rather than higher yields per hectare. We assume for the baseline analysis that yields per hectare have been rising at an average of 2 per cent per annum for traditional practices, and 2.5 per cent when improved or high-input practices are adopted.

Maize prices have strong seasonal variations — low in the post-harvest period (late summer) and rising to a peak in January, as depicted below.

Month	Farm-gate price (US$/ton)
September 1997	87.50
November 1997	142.83
January 1998	175.00

Therefore, farmers can earn more by storing their maize and selling it when grain stocks get low. However, on-farm storage losses (estimated at 2 per cent per month!) are significant with traditional storage systems.

Assuming clearance costs of US$7,000[43] per hectare, evaluating for 20 years, and including an imputed sale price for cleared agricultural land (as in the model developed for Lao PDR), the resulting IRRs are:

Summary results (IRRs)	Include value of household labour[44]	
	No	Yes
High yield	3.03%	0.42%
Improved management	-0.23%	-3.84%
Traditional	-2.44%	-7.56%

[43] *Landmine Monitor Report 1999* gives an estimated average cost of US$6,176 per hectare for Mozambique (p. 48). However, the areas reported "cleared" by some operators are clearly too high, and likely represent the entire length of roads, power lines, and railways surveyed and cleared, rather than the clearance alone. Dropping just the "cheapest" operator and calculating the average for the rest gives an estimate just over $8,400, and costs are likely to have dropped since then. Costs for some operators including Accelerated Demining Programme (ADP) and Norwegian People's Aid seem far higher than this average.

[44] Two cases are evaluated for each production system. In the first, no value is given for household labour. In the second, household labour is valued at the wage rate reported for paid labour (about $0.72 per day).

Given the IRR expected for a project funded by the World Bank or a regional development bank typically is 12 per cent, even relatively high-yielding land in Mozambique does not provide attractive economic returns to mine clearance when the clearance cost is US$7,000 per hectare. How much then would clearance costs have to decline to provide an IRR of 12 per cent for each of the above production systems?

Clearance costs required to yield 12% rates of return (in US$):	Include value of household labour	
	No	Yes
High yield	3,116	2,273
Improved management	2,085	1,279
Traditional	1,576	711

It is apparent that costs would have to be dramatically lowered for mine clearance of agricultural land to be justified on financial grounds alone in Mozambique. However, as was demonstrated in the analysis of the UXO programme in Lao PDR, the combination of productivity increases in both agriculture and clearance operations does enhance the financial pay-off from mine clearance with each passing year. Starting from our baseline cases, how long will it be before mine clearance in Mozambique will be an attractive proposition in financial terms?[45] Assuming clearance costs fall by 5 per cent each year, the answers are:

Years to breakeven (starting with $7,000/ha costs in 1999):	Include value of household labour	
	No	Yes
High yield	11	16
Improved management	12	24
Traditional	22	34

With reasonable estimates for productivity increases, mine clearance of agricultural land in Mozambique remains far from breakeven in simple financial terms.

Extensions

Improving transportation infrastructure and farm-gate prices

Why is the case of Mozambique so different from that of Lao PDR, a similarly poor country? The first reason is that Mozambique has more arable land than Lao PDR. Mozambican smallholders quite rationally use more of the abundant factor of production (land) relative to the scarce factors (modern inputs, tools, labour). Mine clearance adds to the already abundant factor of production. In NPV terms at a 12 per cent discount rate, the estimated future production for 20 years from one hectare of land, plus the sale value of it after that time, is about US$1,655 in Mozambique, whereas

[45] The Lao PDR case assumed the average NPV of land cleared would be 125 per cent of the NPV of the baseline case (rain-fed rice land). This adjustment is not made here as we already are analysing a range of land and cropping systems.

it was estimated at US$3,540 in Lao PDR. Good land is simply worth less — perhaps less than half — in Mozambique than Lao PDR.[46]

A second reason is that Mozambican farmers receive a very low proportion of the retail price for their principal crops. The transportation infrastructure in Mozambique is rudimentary and "transport and handling costs between the port and farm-gate add … 36-74 per cent to the price of exported maize" (Jeje et al., 1999:29).

Third, the retail prices are themselves depressed. Industrialised countries block imports of most food crops from the developing world, while at the same time subsidising the exports of their own agricultural products. Both actions reduce export markets for Mozambican farmers. This, plus the poor north-south transport links, means maize remains in regions where there is a surplus, pushing local retail prices down. Local farmers thus receive only a small portion of a depressed price.

Increasing maize exports to other countries in Southern Africa holds great promise for those parts of Mozambique that can produce surpluses, particularly the north, which generally does not experience droughts on the same cycle as the rest of southern Africa. One study of maize exports to Malawi in 1998 found that northern producers benefit at no cost to southern consumers, with producer prices increasing from US$17-28 per ton[47] since the opening of this trade[48] (Government of Mozambique, MAP/MSU, 1999b:18).

Continued success in export markets coupled with gradual improvements in farm-to-market transportation should result in higher producer prices on top of (and probably stimulating) rising yields per hectare, substantially increasing the rates of return from mine-free land.

The following table outlines changes in some of the key findings for the case of "improved practices", assuming farm gate prices start 15 per cent higher and rise 3 per cent per year for the next five years:

Improved producer prices	No change in producer prices (baseline)	Increasing producer prices
IRR	-3.84%	-1.04%
Clearance cost to yield 12% IRR	US$1,279	US$1,855
Years to breakeven	24	15

This shows substantial improvements in the pay-offs from mine clearance, but not enough to justify clearance of agricultural land in financial terms alone.

[46] This is consistent with other findings. Andersson et al. (1995) estimated agricultural production might increase 3.6 per cent in affected communities in Mozambique; far lower than Cambodia (135 per cent) or Afghanistan (88-200 per cent). The study also found few incidences where Mozambicans try to remove landmines (unlike in other mine-affected countries), suggesting most households can cope by avoiding the mines.

[47] This represents 13-28 per cent of the average farm-gate price used in the cost benefit model.

[48] Of course, households that are net purchasers of maize in the north would pay higher prices, which may increase their vulnerability (Government of Mozambique, 1998:15-16). However, more households in the north are net suppliers of maize, so the region as a whole benefits strongly.

"Shadow wages"[49]

A significant adjustment might be made on the basis of "surplus labour". This arises when there is a large pool of unemployed or significantly underemployed people and the mine action organisations are recruiting from this pool. In such a case, the social cost of employing them is less than the salaries paid by the mine action organisations.[50] The social cost is the value of the lost production in their alternate employment (termed the Marginal Product of Labour or MPL). The salary received in addition to the MPL is viewed as a financial transfer, not an economic cost.[51]

The ADP has a staff of about 500 deminers, virtually all of whom are demobilised soldiers.[52] A study on the socio-economic integration of demobilised soldiers in Mozambique indicates that average 1997 incomes of 93,000 demobilised soldiers amounted to approximately US$290 per annum.[53] ADP pays deminers about US$160 per month, with perhaps another US$40 per month in benefits, so their incomes are over seven times what they would earn on average if they were not working for ADP.[54] Local salaries amount to perhaps 45 per cent of total costs for mine action organisations in Mozambique. Assuming the shadow wage is a maximum of one-fifth of the financial wage bill and treating the rest as a transfer means the net economic cost to Mozambique's society (i.e., foregone production from alternative employment) of clearance falls from US$7,000 to US$4,480 per hectare. Evaluating the previous case (improved producer prices) at both "monetary wages" and "shadow wages" yields the following comparative results:

Use of "shadow wages"	Evaluated at monetary wages	Evaluated at shadow wages
IRR	-1.04%	2.51%
Clearance cost to yield 12% IRR	US$1,855	US$1,841
Years to breakeven	15	10

With this adjustment, mine clearance of basic agricultural land with improved practices turns slightly positive, but its economic return remains far below what is needed to justify these activities on economic grounds alone.[55]

[49] This term refers to the value of a person's production in alternative employment (i.e., to evaluate what he or she would contribute to society's well-being). When there is widespread unemployment and underemployment because of "surplus labour", this "shadow wage" may be far lower than the wage actually paid to a worker in a modern organisation. One must be very careful about surplus labour arguments in land-abundant economies, but this analysis focuses specifically on demobilised soldiers.

[50] Of course, the same argument holds true for any development activity that hires "surplus labour". Some of these may be more labour-intensive and, therefore, more beneficial in these terms than demining.

[51] The general economic logic is that a simple transfer from one person to another changes the income distribution but not society's total income (roughly, GNP). For example, someone might give money to his/her mother and society is not short-changed. Taxes are also transfers from private individuals to governments, and are not treated as economic costs (unless they are high enough to discourage economic activity or fuel corruption).

[52] We are unaware if the mine action NGOs (HALO Trust, NPA, Handicap International) have hired demobilised soldiers. Certainly a number of the commercial firms have done so.

[53] Barnes (1997:9), plus author's calculations.

[54] It seems unlikely in Mozambique today that they would obtain well-paid positions elsewhere. ADP has fired 70 deminers for various reasons, all of whom remain unemployed. (Conversation with Derek Baxter, Technical Adviser, and Pedro Martinez, Director of Finance, ADP, 19 July 2000).

[55] Note also that this analysis is done from the perspective of Mozambique's society. In this case the transfer is from ADP to a Mozambican citizen and, therefore, imposes no cost on society as a whole.

This of course does not mean that mine action has not contributed significantly to Mozambique's reconstruction and development. Most mine clearance seems to have targeted key infrastructure (roads, railways, power lines)[56] for which rates of return are often very high. Early mine clearance also facilitated the return of refugees and internally displaced persons, reducing burdens on international refugee agencies plus neighbouring countries and their populations, paving the way for the rapid recovery of Mozambique's agricultural production and, most fundamentally, speeding the recovery of the country's social fabric. Mine action organisations also have made an important contribution to peace-building by providing attractive employment for significant numbers of demobilised soldiers. The analysis does suggest, however, that large-scale clearance of agricultural land will not, in itself, make a significant net contribution to Mozambique's continued development, largely because land is abundant in most of the country. A more targeted approach will be necessary.

Tighter targeting of mine clearance

Food security

At the beginning of this chapter, using data from Lao PDR, we gave an example of broader social cost-benefit analysis in which extra value was placed on clearing land for land-poor households that are particularly vulnerable to food insecurity. Mozambique is not short of land ***in general***, but specific regions are. However, these are mostly in the dry south, where the major vulnerability faced by farmers is drought and (as was made clear in 2000) floods. This suggests that economic ***and*** social benefits would accrue more from investments in water control than general mine clearance. In this case, clearance activities should be planned to support small-scale irrigation and other water projects (e.g., water points for cattle; village potable water schemes).

We also saw that specific households are land poor throughout Mozambique because of the manner in which land rights are allocated via both customary and official systems. In one excellent study of a traditional land rights system (de Marrule, 1998), households from a "weak" lineage (*N'loko*) are more likely to be land poor, even if there is no general shortage of good land in the surrounding area. Could such households be targeted?

Unfortunately, this would be extremely difficult. The study notes the general belief that "luck follows lineage". When respondents were asked why members of rich *N'loko* should get more land, "the answer came back to *natureza*:[57] the *Regulo* would think that the 'poor' individual would not be able to adequately farm the land" (de Marrule, 1998:76).

Another complicating factor is related to traditional coping arrangements based on the extended family. Key informants were asked "what would happen if someone from a poor *N'loko* nevertheless managed to get, for example, a cotton field and make a good profit, attempting to reinvest that in cotton or another income-generating

However, ADP receives virtually all its funding from donor countries, which might reasonably have a different view concerning whether the adjustment is warranted. Even from ADP's perspective, the salaries paid are a cost for which it must account.

[56] Based on somewhat conflicting figures in the International Campaign to Ban Landmines *Landmine Monitor Reports* for 1999 and 2000, we estimate 78-85 per cent of the total area reported as cleared has been for infrastructure.

[57] "Implying that one's position, originally given by Deus, comes to be seen as part of the person's character (*natureza*)" (de Marrule, 1998:75, footnote 24).

activity?" The response was that the members of the extended family would come to that person requesting assistance (essentially food and cash), and soon that profit would be used-up by being spread-out among many in the *N'loko* (de Marrule, 1998:77).

Targeting clearance to benefit land-poor households would require: (1) intimate knowledge of the customary land rights system in the local area; (2) the identification of specific land-poor households; and (3) a means to ***overcome*** the customary land rights system to ensure the cleared land actually goes to the intended household(s). Even if these formidable information problems could be overcome, it may well be that the land-poor household will not make good use of their extra land, because its members would have to share the fruits of their labour with others in their kinship lineage.

Targeting women

Another possible targeting strategy would be projects that benefit women. In Mozambique, women are responsible for planting, tending, harvesting and processing crops, as well as numerous other familial and household responsibilities. Time studies suggest daily schedules of 14 to 16 hours for women, with cropping and water gathering each accounting for three to four hours daily (World Bank, 1997:52). Reducing the burden on women's time would certainly be just, and will contribute to the well-being of all household members.[58] Because of their central role in agricultural production, reducing time burdens on women may also result in significant economic benefits, as the following example suggests.

Consider a community where direct access to the closest water supply point has been mined. Because of this, 40 women in the community spend an average of 3.5 hours per day obtaining water (the Mozambican average). Clearing access to the water point would reduce this to 1.5 hours. What are the social and economic pay-offs? These will depend on how the women allocate their "free" time. Assume 60 per cent goes to raising crops, and the Marginal Product per Labour day (MPL) averages about 4.2 kg of maize (Government of Mozambique, MAP/MSU, 1998b:42).[59] The benefits are (evaluated for 20 years and recognising the water supply point has a "capital value" at the end of that period):

Clearing water supply point	Valuing just agricultural production	Valuing all time at MPL of agriculture
NPV, discounted at 12 per cent	US$9,711	US$16,171

This implies that clearance costs of over US$9,700 would be justified on economic grounds alone if only the incremental agricultural production is valued. Costs of US$16,171 would be justified under the reasonable assumption that the time women choose to spend on non-agricultural pursuits is just as valuable to them and their households as time spent cropping.

Why are these results so positive when the earlier analysis suggested clearance of agricultural land is not a good investment? The scarce (and therefore, valuable) factor

[58] A major cause of malnutrition in infants may simply be the lack of mothers' time to give them more than two feedings per day, when they require four to five for adequate calories (World Bank, 1997b:52).
[59] At 1997 exchange rates (US$1 = Mt 11,500) and reported prices (Government of Mozambique, MAP/MSU, 1998b:82), this amounts to US$0.42 per day's labour.

of production for Mozambican smallholders is ***women's time***. Clearing a water supply point augments the scarce factor of production and delivers high returns.

Clearly, there are some types of mine clearance in Mozambique that offer very significant social and economic returns. Indications are that some mine action operators in Mozambique are aware of this, and are testing new approaches. Handicap International focuses on small-scale "proximity clearance" in Inhambane. HALO trust has initiated "demining fire brigades" in Niassa province for quick response to so-called low priority tasks. The International Development Research Centre (IDRC) is working with the National Demining Insitute (IND) on the Integrated Mine Action Development Strategy (IMADS) concept. From 1998, NPA started to include community development services — in the form of Quick Impact Projects — in its demining sites. Socio-economic analysis strongly supports the thrust of the Mozambique case study, suggesting experiments with such community-based approaches are needed.

However, there is no guarantee the incremental benefits will outweigh the added costs. In this case, as with development projects in general, the balancing of costs and benefits is complicated by a further issue: who pays the cost, and who reaps the benefits?

Incentives and community development

The last point is critical to economic analysis because there are many subsidies and transfers embedded in all aid-funded programmes, most public services, and many private operations. Typically, "private" rates of return will differ from "social" IRRs, sometimes substantially. Certainly "donor" IRRs will vary from those of recipients. While recognising that altruism exists and is sometimes (as with aid) a potent force, economists generally find it safer to assume that individuals tend to further their own interests when making decisions: that is, they consider their private rates of return rather than returns to the wider society. This often leads to socially "sub-optimal" decisions.

Private IRRs are incentives to behaviour, as are social norms (taking certain actions leads to approbation), laws, and the rules and policies within an organisation. To an economist, understanding incentives is critical, and expecting people will behave in ways contrary to their own perceived best interests is "incentive incompatible". If we wish individuals to make socially optimal decisions, the surest way is to "align their incentive structures" to make such decisions "incentive compatible".[60]

Consider a common situation. A mine action operator approaches a mine-contaminated community and asks residents if they want their lands to be cleared, with no charge. How many communities will refuse the offer? What does their response tell us about whether landmines are a major constraint to the community's well-being? The private IRRs to the residents are extremely high because the clearance costs they bear are negligible; perhaps only the inconvenience of hosting a clearance team for a few weeks.

NGOs and other development organisations are well aware that this is not a good start to a development project. Typically, they will ask the community to contribute

[60] Like most social scientists, economists are always trying to comprehend people through the use of incomprehensible language.

something of value to any project so the community feels "ownership" over whatever the project produces because, in a sense, they have purchased it. Often, the community contributes labour and materials that can be obtained locally.[61] This will raise private costs, bringing private IRRs somewhat closer to the social IRR.

Many NGOs and development organisations in general are now using more sophisticated "participatory" approaches to community development projects. These entail having the community decide its own priorities, with the understanding it will receive some (often modest) assistance in meeting priorities that are technically and economically feasible. This is akin to giving the community a budget and letting it then decide what to spend it on (from a limited set of options). In economic logic, this involves a transfer of resources to the community (no economic cost to society as a whole) and then having the community decide how to allocate those resources for maximum benefit. This fully aligns the community's IRR with the social IRR,[62] resulting in a socially optimal decision.[63]

Such approaches hold great promise for mine clearance. Imagine a community is given a budget from which it can choose to purchase mine clearance, potable water, a culvert to prevent their road from washing-out, a community "grain bank" to reduce storage losses,[64] or other common things that would improve residents' well-being. If it chooses to spend all or part on mine clearance, there is no further need to justify mine clearance as a top priority for that village.[65] Conversely, if the community chooses another mix of development projects, then mine clearance resources are freed to meet the needs elsewhere. In any case, one would know the community values what it has chosen, and is likely to use and maintain what is left behind.

Mine and unexploded ordnance awareness

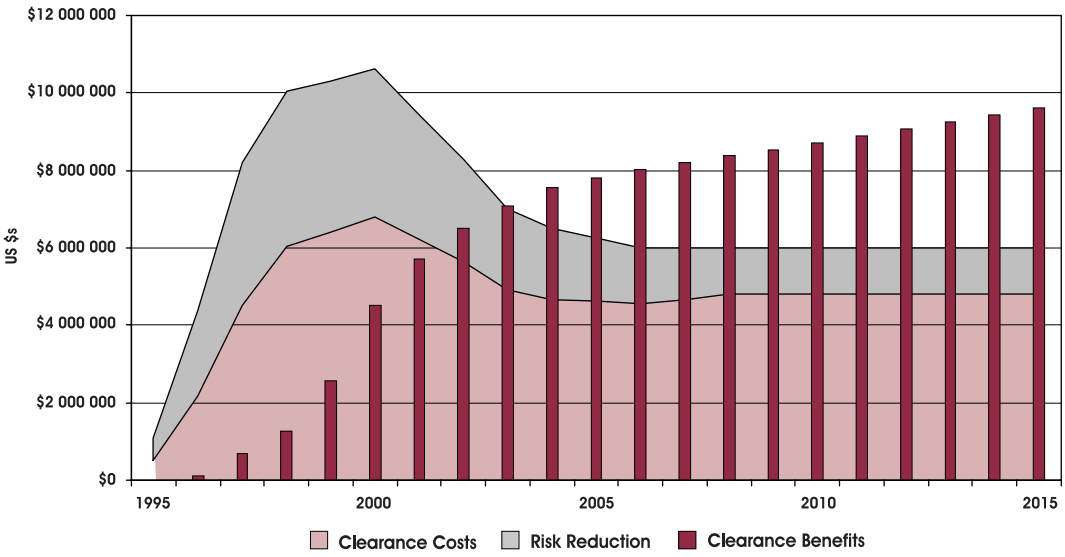
Evaluating the cost effectiveness of risk reduction

The sections above evaluate mine clearance in Lao PDR and Mozambique and the costs apportioned to these programmes. Figure 13 depicts all costs — clearance plus risk reduction —with the projected benefits from clearance in Lao PDR.[66] The IRR (evaluating from 1995 to 2015) is minus 2.34 per cent using the baseline assumptions, or minus 1.72 per cent if the estimated costs of tied aid are charged against donors rather than UXO LAO. Extending the analysis to 2015 improves these IRRs to 3.72 per cent and (with the tied-aid adjustment) 4.18 per cent, which is still hard to justify on purely economic grounds. Treating capacity-building and start-up expenses as sunk

[61] UXO LAO and its implementing partners ask communities to cut vegetation in advance of the clearance operation, after first instructing them on safe cutting methods! Action contre la Faim in Lao PDR uses good approaches in having villages provide all the unskilled labour and the cement for community potable water projects.
[62] At least with respect to the community development options the NGO can offer.
[63] Assuming the decision reflects the collective interests of all members of the community. Much of the "art" in participatory approaches lies in ensuring the voices of women, poor households and other commonly disenfranchised groups are heard.
[64] Cutting storage losses in half could yield very high dividends by (1) making more grain available for sale and, more importantly, (2) allowing grain to be stored until prices are higher.
[65] This also is the surest way to incorporate the value placed on risk reduction into the analysis. Communities will certainly weigh their added security from mine clearance against other improvements they might achieve in their community's economic and social well-being.
[66] See the *Lao PDR Case Study* in Appendix 2 of this document.

costs gives IRRs for future operations (2000-2015) of 13.85 per cent and (with the tied-aid adjustment) 15.08 per cent. However, this does not give an assessment of those expenditures made on risk reduction, as all the economic benefits stem from land clearance. Can one make an economic evaluation of risk reduction?

Figure 13: Clearance Costs and Risk-Reduction Costs (baseline case)



Formal cost-benefit analysis is not particularly illuminating for assessing the benefits accruing from risk-reduction measures instituted in poor countries. Reducing the deaths and injuries from UXO accidents does free medical resources for other public health tasks. However, the medical costs of treating UXO victims is minuscule compared to the risk-reduction expenditures of UXO LAO,[67] so a cost-benefit case cannot be made unless monetary values are placed on human life and suffering. Cost-effectiveness analysis[68] is a useful tool in such situations. For example, one can compare the average cost of saving one life through a mine/UXO programme and compare this to the cost of saving one life through, say, malaria control or training programmes for traditional birth attendants.[69]

Unfortunately, we have no accurate count of the number of lives saved and injuries avoided in Lao PDR due to UXO awareness activities, roving clearance, etc. However, even very rough calculations demonstrate that UXO/mine awareness and roving clearance are relatively expensive in terms of lives saved and injuries avoided relative to various other public health and safety programmes in Lao PDR. Deaths from UXO accidents seem to have averaged 240 per year in the decade before the Socio-Economic Survey, and may be averaging fewer than 200 per year since 1997. About half the accidents are fatal, so there are 40-50 fewer deaths per year from UXO accidents, with a similar reduction in injuries. The UXO LAO "cost capture study" (unpublished)

[67] No estimate is available for Lao PDR, but those from other countries suggest a figure of US$550 per year per victim (cited in Harris, 2000a:221).
[68] See Hallam (1998) for a thorough treatment of this topic in the context of humanitarian assistance.
[69] Put another way, cost-effectiveness analysis measures the "internal efficiency" of a programme or organisation, or the ratio of inputs used to outputs or outcomes produced (in this case, deaths/injuries averted). It does not attempt an explicit assessment of the "external efficiency" — the impact or value of the outcome produced to the wider society.

estimated the costs of community awareness activities at about US$700,000 in 1999, with roving accounting for another US$860,000. Even with the implausible assumption that all accident reduction has been due to community awareness and roving, the cost per death/injury avoided is over US$15,000.[70] Meanwhile, public expenditure on health amounts to only US$5 per year per person, and annually there are 1.4 million cases and 14,000 deaths from malaria, which can be combated through inexpensive insecticide-treated bed-nets. Put another way, if a socio-economic case can be made for risk reduction, the same economic case for other public health measures in Lao PDR would be many times stronger.

Roving clearance certainly provides some purely economic benefits in addition to risk reduction. By removing surface UXO from communities and paths, it allows freer access for people to go about their business. In some cases, it will allow infrastructure such as schools and health clinics to be used instead of lying idle. Also, there are likely to be reasonably strong complementarities between roving and UXO clearance. Roving teams can survey possible sites for clearance, provide job rotation opportunities to relieve deminers from the drudgery of clearance, and can operate when weather makes clearance difficult. However, it is difficult to see how such benefits might be quantified.

On balance, the benefits accruing from risk reduction seem modest, both in cost-benefit terms and by cost-effectiveness comparison with the potential to save lives and well-being through other public health measures. A certain amount of roving is probably a useful adjunct to full clearance operations, but the continued shift of resources from roving to clearance certainly seems warranted. Regarding UXO awareness, there is a strong moral case that members of the international community bear most responsibility for the UXO problem in Lao PDR, and they should provide financial and technical assistance for the establishment of the appropriate public safety programmes. Still, it is necessary to design these programmes to be cost effective and financially sustainable in the long run, as the UXO problem in Lao PDR will be enduring. Low-cost programmes through mass media (e.g., radio) and existing institutional channels (e.g., the school system) seem to offer more long-term promise than continued visits of community awareness teams to individual communities.

[70] Including salaries of international personnel would raise these costs to about US$1,750,000 and US$2,150,000 respectively. The cost per injury or death avoided would then climb to almost US$40,000.

Chapter 4

Setting priorities

This chapter outlines some of the main factors that underlie the establishment of priorities and which should be reflected in the decision-making criteria used by the mine action community.

The basic approach

Setting priorities is a rational process that entails some reckoning of the costs and expected benefits of alternative actions to target available resources for maximum benefit. When costs and benefits can be quantified, those tasks offering the best ratio of benefits to costs are given priority;[1] in other cases, tasks that meet a set of criteria are undertaken.

Calculating costs is reasonably clear-cut, but estimating expected benefits is often fraught with complications. As a result, priority setting is not necessarily a rigorous, quantitative exercise, although it should be systematic in judging each alternative against the same criteria. Formal cost-benefit analysis can identify the solutions in reasonably straightforward cases (see Chapter 3 above), and can provide at least partial answers in most other situations. But human judgement is required to weigh the relative values of different benefits, estimate the likelihood that these benefits will be achieved and sustained, and decide among alternative actions. Because of this irreplaceable human factor, the decision-making process itself influences the quality of the choices made and the degree these are acceptable to those with a stake in the decision (see Box 7).

[1] In theory, the benefit-cost ratio could serve as a single criterion for ranking priorities. In practice, other criteria are used to ensure both technical and institutional feasibility and to screen out actions that would cause serious damage to the environment, or an ethnic group, etc.

Box 7: The Decision-Making Process

The decision-making process itself influences the choices made. Factors include:

Who makes the decision? The decision to undertake specific mine action activities can be made by different development actors — each with distinct motivations — including:

- Mine action managers;
- Managers of internationally-supported programmes/projects (reconstruction, peace-building, resettlement, development) by commissioning or hiring mine action personnel;
- Governmental, including local, authorities; or,
- Private individuals or firms.

Who has input into the decision? Decisions will be more informed if "stakeholders" (i.e., those with an interest in the decision, including funders, national authorities, and affected communities) are allowed to participate. But participation entails costs, and there is a point at which the extra costs exceed the benefits.

To whom is the decision-maker accountable? All decision-makers should give a periodic accounting of what has been achieved with the resources entrusted to him or her. Is an accounting given only to the funding agency, or also to the national mine centre? Provincial and local authorities? The ultimate beneficiaries in mine-affected communities? More accountability is better, but reporting costs time and money and mechanisms are needed to resolve conflicts.

What alternatives are available for consideration? The alternatives available to any decision-maker are "bounded" by constraints imposed by authority (resources, geographic responsibility, functional responsibility), data, and, roughly, the capacity to analyse the data to compare among alternatives. The analytic capacity is in turn determined by knowledge (training and experience), time available, and tools available. Systematic data collection reduces data constraints, training can compensate for lack of experience, and the provision of specialised staff and computer support can allow more analysis within the same period of time.

What decision-making rules are used? Decision-makers can try to optimise (i.e., rank every alternative then work from top to bottom as resources permit) or to seek simply satisfactory results (i.e., accept an alternative if it meets certain criteria or rules of thumb). Optimisation requires far more data and processing, and increases the risk that the decision model will be mis-specified (i.e., does not reflect reality well), leading to systematically incorrect decisions.

Are alternatives considered simultaneously, or sequentially? Ideally, alternatives should be assessed and ranked by priority using the same data at the same time. This may be impossible due to limitations in data (e.g., before a national survey has been completed) or computational capacity. Therefore, alternatives are considered sequentially, either individually or in manageable groups. In such cases, some sort of "satisfying" decision rules must be applied.

Are decisions made in stages? A two-stage decision-making process would assign preliminary rankings to alternative activities, and confirm specific commitments after a further review, either after more information was collected (e.g., a technical survey) or by another person or committee (which would also bring additional information to bear).

For example, the Landmine Impact Survey (see Chapter 2: *Impact of Mine Contamination*) is a decision-making process that seeks **optimal** rankings by **simultaneously** calculating mine impact scores for all communities. In a typical case, decisions are made by mine action programme managers, generally in conjunction with government authorities. Others, including the affected communities, generally provide data but do not otherwise have input into the decision. Decision-makers typically are accountable to national authorities and to an international accreditation centre, but not to local authorities or the intended beneficiaries. The limited ability of surveyors to collect standardised data from all communities on items such as the quality or quantity of land contaminated **restricts alternatives** to a "weak metric" with significant weighting on recent accidents. While not perfect, the limitations inherent in Landmine Impact Surveys are not fatal because a survey forms part of a **two-stage decision-making** process (i.e., high mine impact scores lead to rapid deployment of technical survey teams before a final decision on what mine action is required).

Contextual factors

The major contextual factors — the social and economic features of the country and its communities; the undertakings of other development actors; progress or regress along the conflict-peace continuum — can be thought of as important facets of the "real world". Changes in these factors clearly will influence mine action priorities because, as the real world changes in important ways, so do the opportunities and constraints facing those in mine-affected communities and the costs of addressing constraints and capitalising on opportunities. Therefore, benefit-cost ratios will change, sometimes dramatically. Most obviously, in areas still affected by conflict, survival dominates the concerns of civilians. As conflict abates, refugees return, and "normal" life resumes, people's priorities shift increasingly from survival to creating independent livelihoods and achieving prosperity. Things that are unimportant while conflict prevails — such as safe pasturage after all livestock has been stolen by warring factions — loom increasingly large.

Taking risk reduction as a further example, the dangers posed by mine contamination in a community will depend in part on the social and economic features of that community. These dangers will:

- Increase with the extent of economic specialisation, which stimulates trade and the movement of people;
- Be lower if people have access to alternative resources (e.g., uncontaminated land);
- Increase with the extent of absolute poverty, as the poor often are forced to engage in risky behaviour;
- Be different for men and women because of the different gender roles in society.

Because of differences in these and other social and economic factors, two communities confronted with the same physical pattern of mine and UXO contamination will, in fact, face different risk patterns. Mine action priorities may well be different in the two communities. Further, the risks posed to a community can be magnified by renewed conflict, which will:

- Increase movement as people seek refuge;
- Reduce access to alternative resources;
- Increase poverty; and,
- Destroy the social fabric (e.g., by causing men to flee to avoid conscription), changing the gender pattern of risks.

Similarly, the activities of other development actors in and around a community can dramatically enlarge the size of potential benefits from certain kinds of mine action and increase the likelihood that this potential will be realised. This too should alter priorities.

Accumulating information

As the social and economic features of the real world change, so do the patterns of costs and potential benefits and, hence, priorities. But there is another important source of change over the course of a mine action programme that affects how we set priorities: we acquire more information. In fact, the real world is so complicated we can never understand it fully. Our knowledge of a country and its people is limited by the amount of data we have and our ability to make sense of this data. Even if conditions in the real world are relatively stable, our understanding of it will change as we acquire

more and different types of data, and learn how to convert this into useful information.[2] As our understanding changes, so will our priorities.

To illustrate, a new mine action programme typically concentrates on risk reduction, ostensibly for three reasons. First, donors and mine action personnel are motivated by the desire to reduce human suffering. The removal or marking of landmines posing clear and present dangers, the delivery of mine awareness training, and efforts to assist victims are concrete steps to promote this worthy goal on which all can agree. Second, there are reasons to assume that, on average, the landmines posing the greatest risks to people also impose significant constraints to socio-economic development. Given the same level of contamination, more accidents will occur on land used more intensively, and land used more intensively is generally more valuable. Therefore, the location of accidents provides a reasonably good indicator of socio-economic potential, and removing landmines in these locations will deliver significant social and economic benefits in addition to risk reduction.[3] Third, new mine action programmes typically do not have enough information to assess a wide range of socio-economic factors. Therefore, in the early days of a mine action programme, "compassion rules" when setting priorities.

This straightforward approach to setting priorities evolves over time even in countries where the broad contextual factors — socio-economic features, conflict, development activities — are relatively stable. As more and better information is obtained, increased emphasis can be given to economic potential and other factors that might improve people's livelihoods.[4]

Supply versus demand considerations

In mine action as in other humanitarian and development programmes, donors naturally like to raise their nation's flag by contributing goods made in their country, often via "national champion" NGOs and firms. Similarly, most organisations and people like to do what they are good at doing. This often leads to "supply-led development" in which priorities are set principally on the basis of the type of resources on offer and the skills and aptitudes of those in charge of the programmes. At its worst, this can result in the delivery of unsuitable equipment via tied-aid schemes, and the mobilisation of "experts" with preconceived notions of what needs be done. Even when such problems are avoided, there remains the danger that tasks will be undertaken to make efficient use of a programme's assets rather than to address the priorities of mine-affected communities.

In mine action and other development programmes, objectives are more likely to be achieved and sustained if the intended beneficiaries feel the objectives reflect their own priorities. Demand-led approaches emphasise local "ownership" and focus on effectiveness — doing the right job — before efficiency. Efficiency remains, of course, a worthy goal, but the efficient completion of a worthless task is a waste of resources.

[2] Information is useful and usable data — the right data delivered in the proper format to the right person at the right time.
[3] This is the logic underlying the use of the concept of "essential livelihood space" in Kosovo.
[4] This ***does not*** imply that priorities become less compassionate. For example, in most mine-contaminated countries, many more people die from malnutrition and preventable diseases than from landmines. Mine action to promote food security and the delivery of primary health services will often score higher in a "compassion calculus" than targeting sites of recent accidents.

Analysis versus responsiveness

Mine action planners and managers should strive for efficiency but must first and foremost be concerned with effectiveness — the impact of their programme in the real world. But impact is a complex, multi-dimensional concept — the "effect (of a programme) on its surroundings in terms of technical, economic, socio-cultural, institutional and environmental factors".[5] How can planners and managers get a better understanding of the likely impacts of their decisions? Two broad strategies can be employed. The first is ***analytic***; roughly, using more data and more processing. The second is ***responsive***; adopting the priorities identified by government officials, community representatives, and other development actors. Both approaches have merit and should be seen as complements rather than alternatives.

The advantage of responsive approaches is that they tap into the information and expertise of others, who often are far more knowledgeable than mine action personnel on problems and opportunities at the community, district, sectoral, and national levels. Responding to the priorities identified by local people also increases their sense of ownership, while responding to those of other humanitarian and development organisations increases goodwill and the likelihood that their co-operation will be forthcoming in the future.

The danger with responsive approaches is that government, community, or aid agency officials may, through ignorance or wilfulness, represent their private or institutional interests over those of the people in mine affected-communities. Mine action organisations cannot afford to abandon analytic approaches entirely because they must be in a position to determine whether the priorities identified by others are reasonable and are likely to represent public rather than private interests.[6]

Responding to community needs: Direct participation or representation?

Information concerning priorities can and should be obtained from mine-affected communities. Mine action organisations can garner this information in a number of ways. They can:

- Conduct participatory consultations directly with affected communities;
- Work with international NGOs doing community development work using participatory approaches;
- Work with local NGOs doing community development work using participatory approaches;
- Ask local, district, and provincial officials who themselves obtain "bottom-up" information from the communities they represent.

The first three are participatory approaches, while the last takes advantage of official representatives. The cost of obtaining this information falls sharply as one goes down the list of options. More importantly, the sustainability of the "information system" increases sharply as one goes down the list. Finally, the likelihood that "bottom-up" information can be combined with "top-down" and "horizontal" information about

[5] From the terminology agreed by the Organisation for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC) Expert Group on Aid Evaluation, quoted in Hallam (1998:18).
[6] This is one of the functions fulfilled by monitoring, which is covered in the next chapter.

other relevant plans and developments (e.g., new roads, government health, education, and extension services, sectoral and macro-economic policies, etc.) increases as one works down the list.

There are indeed countries with serious political shortcomings in which official or traditional authorities are unlikely to represent the interests of a community.[7] In such cases, a mine action organisation should experiment with participatory approaches, either directly or — usually better — in conjunction with a development NGO. However, where State authorities are, broadly, concerned with the developmental needs of the communities they represent, it normally is preferable to work with those authorities. If the political system also has mechanisms that effectively channel "bottom-up" community priorities to district and provincial headquarters, mine action operators could simply look to district and provincial officials to establish their priorities. In many poor countries however, provincial and district governments may be well motivated but have no budgetary and human resources to remain in touch with some communities and so lack the detailed knowledge necessary for setting the correct priorities. In such cases, a mine action organisation might support government to undertake its own participatory appraisals of community needs, and so develop skills to continue such work after the demining organisation ceases to operate in that area.[8] This will support the role of the State, be less costly, and carry the added benefit that these same skills can also be applied outside the mine action field.[9]

Responding to national government priorities

The nation State is far and away the most potent force for development of a country. Rapid and widespread development can only occur when the State —through policies, the maintenance of public security and the rule of law, and its mobilisation of resources for investment and public services — is reasonably effective. Where there is an effective developmental State, donor countries, international agencies and NGOs can help accelerate development by providing complementary assistance, but they cannot achieve widespread development in the absence of such a State. The policy and investment choices of a developmental State will be the most important factor in determining which sectors and regions of a country will grow in a dynamic fashion. Normally, these sectors and regions will offer greater pay-offs, in terms of socio-economic development, from mine action. Where there is a developmental State, it is important for the mine action community to understand and respond to its national development priorities.

Clearly the mine action community cannot remain passive and await direction from senior government officials, even in heavily contaminated countries. Landmines were not even mentioned in government-written submissions and verbal presentations to the latest Consultative Group[10] meeting for Mozambique. Similarly, the problems of

[7] In complex emergencies stemming from "failed states" (e.g., Sierra Leone, Somalia) there is no effective government apparatus. In other cases such as Afghanistan, the *de facto* authorities are not recognised by the international community.

[8] Similar reasoning applies where cultural norms exclude certain groups (e.g., women, pastoralists, etc.) from access to officials.

[9] The Government of Mozambique has signalled its willingness to work with NGOs in this manner. "Their close links give NGOs and religious confessions a comparative advantage in the conception and implementation of specific programmes to fight poverty. They can act as intermediaries between the Government and communities." (Government of Mozambique, 1999:52)

[10] These are the principal aid and policy co-ordination meetings between the government and the donor community.

UXO contamination have received barely a mention in the main Lao PDR economic and development documents. Heads of national mine action centres often have difficulty getting sustained attention from senior government decision-makers. Mine action personnel should assume the onus is on them to seek information on government policies and programmes that is relevant for setting mine action priorities.

Responding to priorities set by other development actors

The same rule applies for obtaining relevant information from other key development actors, such as international organisations (World Bank, the regional development banks, United Nations agencies), bilateral donors, and development NGOs. One can hope these organisations will keep the mine action community apprised of plans and programmes that could influence mine action priorities, but it is unsafe to assume this will happen. Experience in Kosovo and most mine-contaminated countries suggests that few development agencies formulate their plans with sufficient spatial information to assist mine action personnel in setting priorities. Even if these agencies have the data in the necessary format, time pressures and inter-agency rivalries mean this is not often provided to mine action managers.

The solution to this problem is not to ignore it and set mine action priorities without considering other rehabilitation and development projects at the community, regional, or sectoral levels. Neither is the answer for mine action organisations to build sufficient expertise in the various social science and development disciplines so they can come to their own conclusions about what sectoral and area development priorities should be. Instead, the mine action community in a country needs to reach out to key government departments and other development actors. Mine action programmes need to have sufficient expertise to know what organisations have the information needed for establishing priorities, and invest sufficient time to meet representatives from those organisations to obtain that information. Mine action organisations also need to adapt their own planning calendars and procedures to those used by other key development actors, so it is easy for other organisations to provide the necessary input. Finally, mine action personnel must be willing to invest time in helping other organisations plan their work programmes and show how mine action can help these organisations achieve their objectives. These are "outreach"', "networking", and "information brokering" functions. To discharge these effectively, a core socio-economic research capacity is required, but large research units are probably unwarranted. The IMADS initiative being piloted in Mozambique (see Box 8) is an example of what might be both useful and affordable.

Concluding remarks

There is no single set of criteria that all mine action programmes should use in deciding priorities...

Instead, the appropriate criteria will differ for labour surplus countries relative to land-abundant ones, or for largely subsistence economies relative to those where most people specialise in producing a small range of goods and obtain their other requirements from the market. Some mine-contaminated countries remain embroiled in conflict while others have secured lasting peace. Governments in some countries are effective in promoting development, while others prey on their own citizens. These

Box 8: Integrated Mine Action Development Strategy (IMADS)[a]

IMADS is a capacity-building tool designed to enhance the ability of post-conflict societies to link mine action into long-term national development planning. IMADS aims to have national authorities gain greater — and more rapid — ownership over mine action programmes by building sustainable research and analysis capacity through the Mine Action Centre (MAC).

Building on outputs generated by the Global Landmine Impact Survey and Information Management System for Mine Action (IMSMA) database and drawing information from sectors such as health, agriculture, and education, will ensure that mine action has a greater and more lasting inter-sectoral impact. Cross-cutting development reports based on combined development and mine action research and analysis will inform national, provincial, and district level planning.

A multi-sectoral and multi-level approach to mine action means bringing in new stakeholders to planning, decision-making and problem-solving processes. This will mean new networks that bring together members of different stakeholder groups to work on mine-related problems. For example, the potential roster would include the MAC, the government, communities, mine action operators, the academic community, funding agencies, and the private sector. Flexible, *ad hoc* focus groups will centre on the mine action requirements for a broad range of development needs, from community goals to larger-scale infrastructure rehabilitation and investment initiatives.

The basis of IMADS is the establishment of a multi-disciplinary research and policy unit at a National Mine Action Centre (MAC), or other appropriate body. This unit will be responsible for generating mine action data and analysis on how best to establish criteria, indicators, priorities, and benchmarks for success in a given national development context. In an effort to promote local responses to local problems, the IMADS Unit will comprise nationally-trained professional staff.

A key IMADS strategy will be to link staff from the MAC and/or Landmine Impact Survey/IMSMA teams and local social scientists with backgrounds in development who are skilled in working with existing primary and secondary data and building sound social and developmental analyses and policy frameworks. It will also attempt to raise the political profile of the MAC by helping to create an inter-ministerial steering committee process, elevating the importance of the MAC and providing a forum for the interchange of ideas and information across different government sectors.

The scarcity of data in many mine-affected countries is exacerbated by the scarcity of people/institutions capable of working with complex data. IMADS will bring in a wider network of thinkers and trainers to make sure the data generated by the Landmine Impact Survey/IMSMA projects is fed into sustainable and useful policy and programming structures.

IMADS is designed to support the pre-existing Global Landmine Impact Survey/IMSMA data collection efforts. IMADS does not seek to replicate these initiatives, rather it casts its objectives further afield and will draw on this information as only **one** component of its support to the MAC in its effort to support knowledge creation and capacity-building.

[a] Information provided by the IDRC office in Johannesburg.

and many other differences across countries are profound, and there is no "magic list" of criteria suitable for all.

... but there is a core set of issues that should be reflected in the criteria used by all programmes.

These are accidents (pattern over time, age and gender breakdown, mine versus UXO, etc.), demographic (numbers at risk, plus their distribution), vulnerability (location, extent, and nature of the contamination, the coping capacity of those at risk, entitlements to assistance should accidents occur), development potential (potential for economic growth and for the alleviation of poverty and inequality), and costs (productivity; cost structure). In countries still in or recently emerged from conflict, the criteria should also reflect political issues central to peace-making and peace-building.

The relative weighting given to different criteria will change over the life of a programme...

Needs evolve as countries move from open conflict to secure peace, and will continue to change as the country progresses on the path of development. Opportunities also change as development projects and other investments are completed, or when national development strategies are rethought. Even when the set of criteria remains constant, the relative weights accorded to each should vary as the society and economy evolves.

... but there are consistent patterns to how the relative importance of criteria will evolve.

Heavy weighting should be given to criteria reflecting risk-reduction objectives while large numbers of people face highly uncertain risks from landmines and UXO (i.e., while conflict continues and in the aftermath, when many displaced people return to their communities). This weighting should decline over time as the affected population learns more about the hazards faced. Conversely, criteria reflecting development potential should receive less weight until peace is well established, as new mine laying or renewed conflict could quickly destroy the potential economic benefit accruing from mine clearance.[11] Risk-reduction criteria should also receive more weight during the initial period of a mine action programme, as it takes longer to acquire and interpret data on complex social and economic features than data on accidents and the location of mines/UXO.

The information required to properly set priorities expands over the life of a programme ...

During its initial period, a mine action programme can use the Landmine Impact Survey or a similar system based heavily on recent accidents to establish clear priority rankings. As noted in Chapter 2: *Impact of Mine Contamination*, experience suggests the mine impact scores will be heavily left-skewed, with a few communities scoring highly and the majority falling around or below the median. Priorities stand out clearly, and a "weak metric" suffices.[12] More and finer information, reflecting a broader range of social and economic features, is required to differentiate between communities that score similarly according to a small number of criteria.

... but in many cases other development actors can supply most of the additional information required.

Other development agencies can advise about national, sectoral, and district development strategies, issues, and priorities. International and local NGOs can often provide detailed information about community development priorities. In countries blessed with reasonably effective governments, national, provincial, and local government representatives can also give much of the information required to set mine action priorities. Obtaining this information may require diplomacy and an outreach effort, but success will allow mine action organisations to concentrate their efforts where they have their greatest comparative advantage — dealing with mine contamination.

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[11] In modern internal conflicts, some part of a country may be secure for extended periods while other parts are visited repeatedly by conflict.

[12] As repeated accidents are likely to occur only on valuable, heavily-used land, clearing land on which repeated accidents have occurred is likely to yield other significant social and economic benefits. In other words, communities that are very heavily impacted according to one criterion are likely to be significantly impacted according to several others.

Chapter 5

Monitoring and evaluation

As mine action programmes become integrated into national socio-economic development systems, so they must adopt the development community's approaches to monitoring and evaluation — both to verify that they have achieved their objectives and to satisfy their donors, governments and other clients. This chapter discusses how the efficiency and effectiveness of mine action programmes can be assessed and proposes some basic criteria for selecting performance indicators.

Introduction

Monitoring and evaluation are different but related functions. Monitoring refers to activities undertaken during the life of a project or programme to track whether progress toward agreed objectives is being achieved as planned. Evaluation is a broader function: "an assessment … of an ongoing or completed project, programme or policy, its design, implementation and results" and is intended, in part, "to improve future aid policy, programmes and projects through feedback of lessons learned" (OECD, 1991:5). Both monitoring and evaluation also promote accountability: have those entrusted with public resources used these as approved to achieve reasonable results?

An examination of ***results*** is central to both monitoring and evaluation. Results arise at many levels.[1] In a well conceived and managed project in which the critical underlying assumptions hold true, a set of planned ***outputs*** are used by the intended beneficiaries to produce desired ***outcomes***, or short- to medium-term changes in the external environment. Further, a set of planned outcomes may eventually lead to the intended ***impacts***, or long-term, sustained changes in the external environment. This hierarchy of results can be combined with the programme logic chain into a "results-based logical framework analysis", as described on page 17.

Four additional points need be made. First, it should be clear that the results achieved at one level are means to an end (i.e., achieving results at a higher level). It surely is

[1] See also the section *Programme context* in Chapter 1, *Introduction*.

good to destroy landmines and to clear land, but what is really valued is the food grown on that land and, even more so, the enduring livelihoods the people create for themselves on that land. Landmine removal and destruction are simply means to an end.

Second, mine action organisations have progressively less control over the results achieved at higher levels in the results chain. Most mine action organisations can, with fair confidence, clear a given area of land or provide mine awareness training to a specified number of people. They are less certain that people will plant crops on the land in the coming season or use their mine awareness to stop risky behaviour. Achieving these planned outcomes depends not only on the outputs delivered, but also on the target beneficiaries using the outputs as intended. Mine action organisations have even less control over the long-term impacts of their actions on society, as these impacts are affected by many other influences over time. Mine action may be ***necessary*** if a contaminated community is to prosper, but it is not ***sufficient*** to ensure development will occur.

Third, it is straightforward to collect and report evidence about outputs: how many mines were destroyed and hectares cleared? It is more difficult to collect and report evidence on outcomes. Follow-up visits may be required, and safeguards put in place to ensure we actually are measuring what we think we are (e.g., are the farmers on the cleared land the intended beneficiaries, or has the land been taken over by the local elite?). Documenting long-term impact is even more problematic. It may not be possible to assess this impact for five years or more, and it often is unclear how to measure something as complex as "prosperity" or "security".[2]

Finally, there is the issue of attribution — is an outcome or impact the result of the project or of other changes? As discussed in Chapter 3: *Socio-Economic Analysis of Mine Action*, this is a particularly vexing problem when assessing mine awareness. Do changes in observed accident rates stem from mine awareness training or from local people learning to avoid minefields in their vicinity? Or from declines in refugee migrations? Or from mine clearance? Or from changes in the statistical coverage? As yet no evaluation of a mine awareness programme has overcome the attribution problem.

Provisions for monitoring and evaluation should be incorporated from the start, when a project is being designed. The pre-existing situation or "baseline" has to be documented if we are to assess whether, and how much, progress has been achieved. We also need some idea of how we are to measure progress and achievements. The pieces of information needed to monitor progress and evaluate achievements are termed ***performance indicators***. Project managers also use ***process indicators*** to monitor whether agreed policies and procedures are being followed, for example, to ensure safety or provide for adequate local participation.[3]

[2] While there are a number of reports documenting the impact of landmine ***contamination***, the first real attempt at an impact evaluation of ***mine action*** was the 1998/99 *Socio-Economic Impact Study of Landmines and Mine Action Operations in Afghanistan* (MCPA, 1999). A follow-on study using a more rigorous cost-benefit approach has been commissioned by the World Bank and UNDP, and was due to be completed in February 2001.

[3] The validity of assumptions should also be monitored because the logic of a project, hence its likelihood of success, is based on those assumptions. If the assumptions prove not to hold true, the project should be redesigned or abandoned. For example, land might be cleared on the assumption that peasants will grow food. If the military appropriates the land, or if the peasants use it to grow opium poppy, the project will not be able to achieve its objectives or will result in unintended, harmful impacts. It should then be halted or redesigned.

Using indicators in emergency and development operations: Examples

In emergency and development operations alike, the international community has devoted extensive time and effort to identifying relevant indicators by which its efforts may be judged. In the emergency context, the Sphere Project[4] — a collaboration among humanitarian agencies — has led to the *Humanitarian Charter and Minimum Standards in Disaster Response*. This seeks to "improve the quality of assistance provided to people affected by disasters and to enhance the accountability of the humanitarian system in disaster response".

The Minimum Standards were developed using broad networks of experts representing five sectors: water supply and sanitation, nutrition, food aid, shelter and site planning, and health services.[5] There are indicators corresponding to each of the standards (see Box 9). Most of the standards, and the indicators that accompany them, are not new, but consolidate and adapt existing knowledge and practice.

Box 9: Sphere Project Standard for Food Aid Requirements and Related Indicators

Requirements standard for food aid: The food basket and rations are designed to bridge the gap between the affected population's requirements and their own food sources.

Key indicators

1. Requirements are based on the following World Health Organization (WHO) initial planning estimates:
   - 2,100 kcals per person per day,
   - 10-12% of total energy is provided by proteins,
   - 17% of total energy is provided from fat,
   - Adequate micronutrient intake through fresh or fortified foods.
2. Estimates of people's food and income sources include consideration of:
   - Market and income opportunities,
   - Foraging and wild food potential,
   - Agricultural seasons and access to productive assets,
   - Sources of income and coping strategies.
3. Ration scales include consideration of:
   - General nutritional requirements,
   - Specific needs of vulnerable groups,
   - Access to alternative sources of food and/or income.
4. Commodity selection includes consideration of:
   - Local availability and market impact,
   - Local acceptability and preparation,
   - Fitness and nutritional composition,
   - Fuel requirements for cooking.

To judge the success of development programmes, a variety of indicators exist at macro and micro levels. At the macro level, the International Development Goals[6] set

[4] The Sphere Project is a programme of the Steering Committee for Humanitarian Response and InterAction with Voice, ICRC and the International Council of Voluntary Agencies (ICVA). The project was launched in 1997 to develop a set of universal minimum standards in core areas of humanitarian assistance.
[5] For a copy of the *Sphere Handbook* see <http://www.sphereproject.org>.
[6] These initially were established by the OECD's DAC, which comprises the major donor nations. The World Bank and the United Nations have since adopted these goals as well.

developmental targets in the following seven areas to be achieved by the year 2015:

- Reducing extreme poverty;
- Universal primary education;
- Gender equality;
- Reducing infant and child mortality;
- Reducing maternal mortality;
- Reproductive health; and
- Environment.

A series of performance targets and indicators, such as those shown below for the goal "Reducing extreme poverty", accompany these goals to provide yardsticks by which progress within a country, and comparisons across countries, can be judged.[7]

	Indicators
Goal: Reducing extreme poverty **Target:** The proportion of people living in extreme poverty in developing countries should be reduced by at least one-half by 2015.	1. Incidence of extreme poverty: Population below US$1 per day 2. Poverty gap ratio: Incidence times depth of poverty 3. Inequality: Poorest fifth's share of national consumption 4. Child malnutrition: Prevalence of underweight under-5s

Measuring results in mine action programmes

Introduction

Mine action organisations have so far been reticent to embrace developmental approaches to monitoring and evaluation, concentrating for the most part on counting outputs such as the numbers of mines destroyed and hectares cleared. Yet, recognition is growing that this will no longer satisfy stakeholders in mine action. Donors and developing country officials now want to know the outcomes achieved — the number of beneficiaries and the extent and nature of the benefits they receive. Officials soon will want assessments of the long-term impacts of mine action — have people been able to create sustainable livelihoods due to mine action and complementary development investments?

The chief outputs of mine action are means to a greater end. Cleared land and infrastructure create opportunities for, but not the assurance of, reduced human suffering and accelerated development. We assume the local people and organisations providing development assistance will then take advantage of these opportunities to build sustainable livelihoods and improve well-being of the intended beneficiaries. But we may be wrong. We may not understand the socio-cultural complexities of local communities that leave cleared land in the hands of the élite rather than the needy. We may be unaware that other material constraints, such as the absence of seeds for planting, mean returnees cannot sustain themselves in spite of the removal of mine contamination. We may lack the data that shows people have learned to avoid minefields and that UXO presents a greater hazard. We may continue to clear agricultural land that women have no time to farm because of the hours they spend collecting water each day. We need to confirm our assumptions are true and verify

[7] See <http://www.oecd.org/dac/indicators>.

that the outputs from mine action programmes are leading to the intended outcomes and desired impacts. In doing so, our purpose is not to draw attention to failures and mistakes, but rather to learn what works and how to improve.

Choosing performance indicators

Performance indicators measure progress toward an objective. The direct outputs of mine action, including clearance and destruction of landmines, mine awareness training sessions, and prostheses fitted to victims, are means to achieve broader goals such as greater security, prosperity, and dignity. Accordingly, we need indicators not only to document our efficiency in converting inputs into outputs (see Box 10), but also to inform us whether these lead to the broader socio-economic goals. The relative importance of these potential benefits will vary across countries and over time within individual countries as they move from conflict to autonomous development. Therefore, there cannot be a single set of indicators; each mine action programme needs to select indicators suitable for its specific time, place, and objectives.

Box 10: Measuring the Efficiency of Mine Action

Efficiency is the ratio of work performed to the resources used or, in the terminology used by the development community, the ratio of outputs to inputs. The ratio can be denominated in physical units (e.g., hours of labour, kilograms of explosives), which is also be termed productivity, or in financial terms, termed cost efficiency.

Mine action organisations typically track and report a variety of efficiency measures: numbers of mines destroyed, areas of land cleared, numbers of people receiving mine awareness training, numbers of prostheses fitted, etc. Such efficiency measures need to be supplemented by indicators reflecting developmental or socio-economic goals if we are to understand whether programmes are effective. However, it is essential that efforts to document efficiency not only continue but also expand and become more systematic. Such measures are needed to compare different techniques to achieve the same output (e.g., manual versus mechanical clearance), compare the productivity of different units and organisations, track safety over time, and assess whether accident rates fall among populations receiving mine awareness. Efficiency measures are the staples in a good project manager's diet of information.

While mine action organisations report a welter of efficiency measures, many, and perhaps most, still fail to report the most revealing cost efficiency figures — **total unit costs**[a] of clearing land, delivering mine awareness, and assisting victims. It is these figures that would allow preliminary cost efficiency comparisons across programmes, organisations, and managers. By not reporting these, mine action organisations fail to meet standards of accountability and transparency that both donors and other stakeholders should demand. More damaging still, some organisations do not even collect and analyse these figures. In failing to do so, mine action organisations are denying their own personnel some of the most powerful weapons in a project manager's arsenal.

The findings of this study suggest most mine action programmes would improve with a better grasp of socio-economic approaches to mine action. Most would similarly improve by adding cost/managerial accountants to their rosters.

[a] Total costs include those for capital equipment, international staff, and allocations to cover headquarters expenses and other common services.

The core of this report has provided not a blueprint but rather general approaches to illustrate how some of mine action's broader contributions to development — particularly agricultural production — might be measured. A fuller assessment will eventually require indicators for measuring progress toward more abstract socio-economic goals, such as peace-building, social reconciliation, enhancing social capital, and reinforcing local governance. Guides for developing such indicators do exist (see Box 11), but a useful first step would be for mine action managers to clarify which of

the broader development objectives they seek to further, then identify the indicators needed to assess their achievements vis-à-vis these specific objectives. The concluding section of this chapter provides a short example of how to approach this task.

Box 11: Criteria for Assessing Performance Indicators

Development agencies have compiled guides for selecting and using indicators. One of the best is the series from USAID, *Performance Monitoring and Evaluation TIPS* from which this is drawn.

1. Direct: A performance indicator should match as closely as possible the result it is intended to measure. It should not be pegged at a higher or lower level than the result being measured. For example, *contraceptive prevalence rate* is a direct measure of the result — *increased use of family planning methods*. But *number of service providers trained* would NOT be a direct measure of the result *improved service delivery*. Just because people are trained does not necessarily mean they will deliver services better.

If using a direct measure is not possible, one or more proxy indicators might be appropriate. Proxies are *indirect* measures that are linked to the result by one or more assumptions. For example, in rural areas of Africa it is often very difficult to measure income levels directly. Measures such as percentage of village households with tin roofs may be a useful, if somewhat rough, proxy. The assumption is that when villagers have higher income they tend to purchase certain goods. If convincing evidence exists that the assumption is sound, then the proxy may be an adequate indicator, albeit second-best to a direct measure.

2. Objective: There should be no ambiguity about what is being measured. That is, there is general agreement over interpretation of the results. An objective indicator is both unidimensional and operationally precise. *Unidimensional* means that it measures only one phenomenon at a time. Avoid trying to combine too much in one indicator (e.g., measuring both access and use). *Operational precision* means no ambiguity over what kind of data would be collected for an indicator. For example, while *number of successful export firms* is ambiguous, *number of export firms experiencing an annual increase in revenues of at least 5 per cent* is precise.

3. Adequate: Taken as a group, a performance indicator and its companion indicators should adequately measure the result in question. How many indicators should be used to measure any given result? The answer depends on a) the complexity of the result being measured, b) the level of resources available for monitoring performance, and c) the amount of information needed to make reasonably confident decisions. For some results that are straightforward and have tried and true measures, one performance indicator may be enough. For example, if the intended result is *increased traditional exports*, the indicator *dollar value of traditional exports per year* is probably sufficient. Where no single indicator is sufficient, or where there are benefits to be gained by "triangulation" — then two or more indicators may be needed. However, avoid using too many indicators. Try to strike a balance between resources available for measuring performance and the amount of information managers need to make reasonably well-informed decisions.

4. Quantitative, where possible: Quantitative indicators are numerical. Qualitative indicators are descriptive observations (an expert opinion of institutional strength, or a description of behaviour). While quantitative indicators are not necessarily more objective, their numerical precision leads to more agreement on interpretation of results data. However, even when effective quantitative indicators are being used, qualitative indicators can supplement with richer information to bring a programme's results to life.

5. Disaggregated, where appropriate: Disaggregating programme results by gender, age, location, or some other dimension is often important from a management or reporting point of view. Experience shows that development activities often require different approaches for different groups and affect those groups in different ways. Disaggregated data help track whether or not specific groups participate in and benefit from activities intended to include them.

6. Practical: An indicator is practical if data can be obtained in a timely way and at a reasonable cost. A rule of thumb is to plan on allocating 3 to 10 per cent of total programme resources for performance monitoring and evaluation.

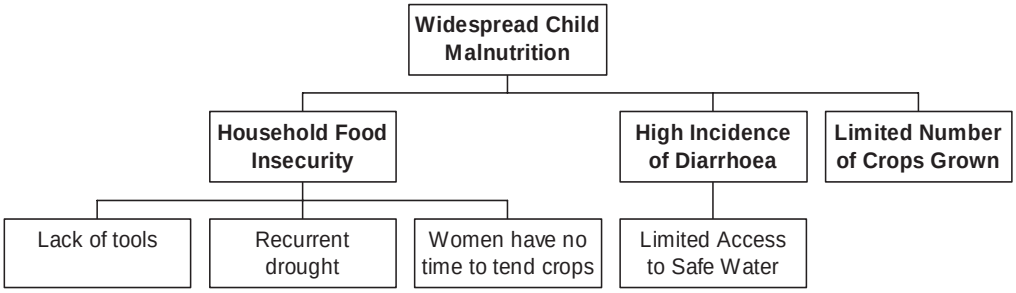
7. Reliable: Can data of sufficiently reliable quality for confident decision-making be obtained? The data that a programme manager needs to make reasonably confident decisions is not necessarily the same standard a social scientist requires. For example, a low cost mini-survey may be good enough.

Summarised from <http://www.dec.org/usaid_eval/#004>

An illustration of setting objectives

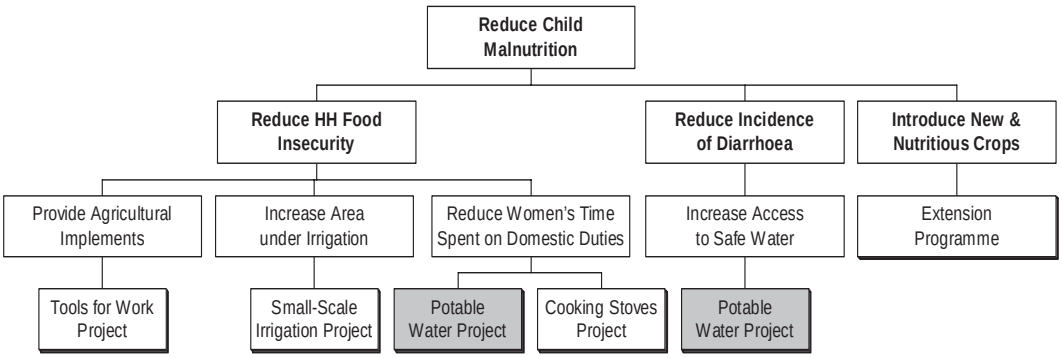
One of the International Development Goals adopted by OECD's Development Assistance Committee, the World Bank, and UNDP is "Reducing infant and child mortality", with a target of a two-thirds reduction from the 1990 level of infant mortality by 2015. An African country wishes to achieve this goal, and establishes an interdepartmental committee to work with donors on a strategy and a new generation of programmes and projects. It analyses the problem and develops a problem analysis tree relating to child malnutrition, one of the chief contributors to its high child mortality rate.

Reducing Child Malnutrition - Problem Analysis



The working group then sets general objectives for each of the problems, and lists the programmes and projects needed to promote these objectives. A sample of this work is illustrated below. Multidisciplinary teams begin working on the specific project designs, including one for potable water, which aims to promote two important objectives: (1) reduce household food insecurity (by reducing the amount of time women spent collecting water, leaving more time for tending crops) and (2) reducing the incidence of diarrhoea.[8]

Reducing Child Malnutrition - Objectives Analyses



The team working on potable water designs a Potable Water Project with four main components: the construction of (1) new gravity-fed systems and (2) new bore hole

[8] Some "LFA purists" would not approve of a single project having two broad objectives, but in fact the supply of basic needs such as water generally advances multiple objectives.

systems to villages, (3) the rehabilitation of existing village water points, and (4) institutional development. The latter component includes the creation of a village water supply unit within the Ministry for Rural Development, plus pilot projects to create village water committees, in part to mobilise village contributions of labour and local materials for the water systems.

The Ministry for Rural Development initiates a preliminary survey to confirm the extent of the needs and collect baseline data. During the survey, the ministry discovers that 5 per cent of all the villages surveyed have problems with landmines, with twice that number suffering from UXO contamination. In some districts of the country, up to 40 per cent of the villages are affected in some way.

The project design team approaches the national MAC to discuss how this problem could be addressed. Discussions raise the following points:

- The MAC had completed a national Landmine Impact Survey, with the data contained in a GIS database that the Ministry for Rural Development could access;
- Communities had been priority ranked based on a Mine Impact Score derived from the survey data. A high percentage of those target communities for the potable water project that were contaminated by landmines also were MAC priorities for technical survey, but few villages with just UXO contamination were MAC priorities;
- MAC implementing partners were organised principally to clear minefields, and did not have adequate staff trained in Explosive Ordnance Disposal (EOD) for quick response to clear UXO.

The MAC agrees that the mine action programme will respond with high priority to those villages involved in the potable water project that were landmine contaminated. In return, the donors for the potable water initiative agree to fund a special project to train and equip three rapid response UXO clearance teams to address UXO contamination. These teams work as part of the national mine action programme, but give first priority to villages scheduled for work under the potable water project. To obtain the funds, one of the MAC implementation partners has to submit a standard project proposal complete with Logical Framework and a monitoring and evaluation plan with performance targets and indicators.

After consultations with the Potable Water Project design team and the MAC, the implementation partner develops the project proposal, which is summarised in the Logical Framework Analysis on the following page.

Results-Based Logical Framework Analysis – Project: UXO Clearance for Potable Water

Logic chain	Results chain	Progress indicators	Source of indicator data
Goal: Reduce childhood malnutrition in target villages by half the baseline rate.	Impacts: 1. Increase agricultural production in target villages by 10%. 2. Reduce incidence of diarrhoea in infants by 25%.	Goal/Impact indicators: 1. Prevalence of underweight children[a] 2. Maize production per household. 3. Cassava production per household. 4. Incidence of infant diarrhoea.	Baseline data collected by Potable Water Project (PWP). 1. Ministry of Health Survey Unit 2. Agricultural Statistics Unit 3. Agricultural Statistics Unit 4. Ministry of Health Survey Unit
Purpose: Each project year to: 1. Rehabilitate 30 village water points. 2. Construct new borehole potable water systems in 30 villages. 3. Construct new gravity-feed potable water systems in 10 villages.	Outcomes: In target villages, to: 1. Reduce the average time women spend on collecting water to 1 hour per day. 2. Provide potable water in 70 villages. for at least 7000 people per year.	Purpose/Outcome indicators: 1. Number of rehabilitated water points. 2. Number of new borehole systems. 3. Number of new gravity-feed systems 4. Time utilisation studies. 5. Village population statistics.	Baseline data collected by Potable Water Project (PWP). 1. PWP Monitoring Unit 2. PWP Monitoring Unit 3. PWP Monitoring Unit 4. Ministry of Rural Development Survey Unit 5. National Statistical Centre
Inputs: 1.Three 12-person UXO clearance teams, with safety equipment. 2. Three EOD technical advisors. 3. Three trucks and land cruisers. 4. Explosive. Etc.	Outputs: 1. 50 villages cleared of surface UXO per year. 2. Water sites in 20 villages cleared of surface and buried UXO per year.	Output indicators: 1. Number of villages cleared of surface UXO. 2. Number of water sites cleared of surface and buried UXO. 3. Area cleared of surface UXO. 4. Area cleared of surface & buried UXO. 5. Cost/ha of surface clearance. 6. Cost/ha of surface & sub-surface clearance. 7. Team hours/ha surface clearance. 8. Team hours/ha surface and sub-surface clearance. 9. Team incidents. 10. Team incidents/ha cleared	1 & 2 - Site completion reports. 3 & 4 - Technical survey reports; UXO Clearance team weekly reports. 5 – 8 - Monthly cost accounting reports. 9 & 10 MAC Quality Assurance Unit

a Prevalence of underweight children measures the proportion of *underweight children* under-five as a percentage of child population under-five. A child is considered to be underweight if his or her weight-for-age ratio is more than two standard deviations below the median weight for the healthy reference population.

Chapter 6

Data management tools

This Chapter addresses how new information technology, especially Geographic Information Systems, offers important possibilities for improving not only mine action but also development planning and management more widely.

Geographic Information Systems

A Geographic Information System (GIS) "is a database system that allows the user to capture, view, manipulate, analyse and model spatially referenced data. The interest in GIS lies in the technology's use as a spatial database system for assisting in surveys of mine affected areas and its potential for co-ordinating demining efforts at national and international scales. A less frequent, but nonetheless very important, potential application of geomatics technology involves its use in multi-sensor detection systems. While the technology's application in humanitarian demining may be in its 'infancy', the growing interest in GIS is evident from special sessions on the subject at recent demining conferences. The burgeoning of GIS systems offered by companies and agencies in the last few years is further evidence of the growing importance of this technology in humanitarian demining" (Mather, 2000:2).

The Kosovo case study sheds light on the potential for GIS and related tools to bring about significant improvements in the way in which humanitarian and development programmes are planned and managed. The MACC was able to quickly establish a GIS and make it available to sectoral agencies to assist their programming. It is clear from the case study that the mine action community is running ahead of the pack in the use of GIS-based approaches.[1] The following analysis goes beyond the limited experience garnered to date in Kosovo, Mozambique, and Lao PDR and explores the possibilities that GIS approaches will contribute at least partial solutions to

[1] This also seems to be the case in Lao PDR and Mozambique. The socio-economic survey conducted by Handicap International (HI) in Lao PDR produced a standard GIS for that country, while the Landmine Impact Survey and aerial mapping currently underway in Mozambique will do the same for that country.

longstanding co-ordination problems that bedevil the practice of international development.[2]

Two types of co-ordination problems

Virtually all problems in development can be seen as co-ordination issues, which typically are more difficult to solve in developing countries than in wealthier ones. For an obvious example, all households in a poor community may want a secure supply of potable water close at hand, but lack a means of organising to obtain it.[3] Even if the community could obtain the water supply, maintaining it through the years is likely to prove a more difficult problem.

In a slightly more complicated case, various members of a community might be considering small investments that would mutually reinforce on another. For example:

- One grain farmer wants to invest in better agricultural inputs to produce and sell a surplus of grain;
- A widow is considering a small bakery to raise school fees for her children; and
- An older farmer would like to retire from manual labour and sell fertiliser he can obtain from a relative in the provincial capital.

If all proceed, the grain farmer will benefit from the available fertiliser and from the baker who would buy the surplus grain. The baker would have a ready supply of grain and a likely market in the fertiliser dealer who no longer produces his own food. The fertiliser dealer can easily buy prepared food and has a market in the grain farmer. By going forward with their plans, each benefits the others, and total welfare in the community is likely to grow because specialisation allows greater productivity. However, it may be that none of the investments is feasible unless all three proceed. Even with such a simple example, the three potential entrepreneurs may not be able to co-ordinate their investments.

The water supply case illustrates a public goods'[4] problem, while the second example is a "co-ordination failure"[5] in the provision of normal, "private" goods and services. In terms less specific to economists, we will refer to the first type as a "vertical co-ordination" problem requiring a method of arranging inputs (pipes, pumps, labour, etc.) to be combined to produce (and often maintain) a desired output. By contrast, the second type is a "horizontal co-ordination" problem, where outputs from ***diverse***

[2] For examples of recent GIS-based approaches to geographic targeting for poverty programmes — a similar problem in priority setting, see also Bigman and Fofack (2000); Hentschel et al. (2000); Bigman et al. (2000); and Fofack (2000).

[3] Conceivably, this could be done through the market (one household constructs the water system and charges others for use), through a local government (using local taxes) or community-based organisation (e.g., a co-operative), or by convincing a higher level of government to provide it.

[4] A "public good" exists when (1) it costs little or nothing to have an extra person benefit from it and (2) it is difficult to exclude someone from benefiting from it. A classic example is national defence. Once an army is in place to protect one million citizens, it costs no more when another child is born, and that child will receive the same security as other citizens. Together these conditions imply the private sector will not provide such goods in socially-optimal quantities, as there is no means of collecting payment from the beneficiaries or from preventing non-payees from benefiting. However, the state can tax the population to pay for the public goods.

[5] In economics, the term "co-ordination failure" refers to situations where individuals are unable to co-ordinate their choices to achieve a state of affairs that would be preferred by all over the existing state of affairs.

projects must occur at the right time, place, and sequence for any of the individual projects to be justified.[6]

In the 1950s, early theories in development economics focused principally on horizontal co-ordination issues. These theories recognised that pay-offs to individual projects are modest in a poor economy precisely because of the poverty (i.e., lack of demand and buying power). As such, ways had to be devised to undertake multiple diverse investments more-or-less simultaneously, so the pay-offs from each would be enhanced by spill-over benefits from other investments, and vice versa. This type of development economics theory was abandoned, for two reasons.

First, such issues are complicated and economists of the day could not develop models to rigorously study the implications of the theories in a truly useful manner, so development economics lost much of its appeal to new generations of economists (Krugman, 1995). In practice, real life complexities overwhelmed the capacity of economists and planners to "manage" economic growth via five-year development plans.

Second, it became apparent that, in developing countries, one could not assume that individual investment projects would be implemented properly or, if implemented, maintained.[7] Simple "vertical co-ordination" problems abounded. Development practitioners turned their attention to these and developed "programme logic" models as tools. Over the past quarter-century, the planning and management of development programmes and projects has become dominated by programme logic models.

Programme logic models are reasonably good for managing vertical co-ordination issues by focusing resources and attention on the intended objective. But this benefit comes with a price: a narrow focus means broader implications may be overlooked and the project will have unintended consequences, for better or worse. Over the past 25 years, certain types of problems have emerged sufficiently often that the development community has taken remedial action. This typically starts with the addition of an extra specialist to the project team to identify and monitor, say, gender or ecological issues. With time and experience, some of these issues become sufficiently familiar to development practitioners that they no longer treated as "add-ons" and instead are "mainstreamed" — part and parcel of the planning of virtually all development projects. Slowly, progress is being made in learning how to cope with disparate issues while retaining focus on the principal objective.

Far less progress has been made in learning how to deal with horizontal co-ordination issues. In the 1980s for example, there was a rash of "Integrated Rural Development"

[6] In economic reasoning, each project creates benefits for the other projects, but entrepreneur One has no means to get the other two to pay for the benefits they receive. Receiving no payment for these spill-over benefits, he does not value them when deciding whether to proceed with the investment. He will not proceed if his costs exceed his private benefits, even though total benefits — including those received by the other two entrepreneurs — may exceed costs. The spill-over benefits are termed "positive externalities". Pollution is a common example of a "negative externality", where the polluter often cannot be made to pay for the damages his actions inflict on others.

[7] After the Second World War, the US instituted the Marshall Plan to finance reconstruction in Western Europe. These countries already had professional and technical workers, and the institutions needed to plan, manage, and maintain investment projects — all they needed was money. When similar approaches were tried in developing countries, many investment projects failed due to a lack of trained and experienced personnel and weak institutions. Much development effort is now spent on "capacity-building" to develop institutions, organisations, and human resources.

programmes to address the multidimensional nature of rural poverty. Such projects generally performed poorly because top-down planning and management approaches could not co-ordinate the activities of many specialised agencies and personnel working on different aspects of rural development: agriculture, feeder roads, extension, inputs, product markets, non-farm employment, etc. (World Bank, 1997). The development community understands the need to cope with such co-ordination issues, and new approaches are being tested,[8] but few expect quick solutions.

Underdevelopment traps

Unfortunately, as the first generation of development economists well understood, horizontal co-ordination is the key to lifting poor countries, regions, and communities from their low-income traps".[9] This is because one investment has spill-over benefits for other possible investments. Some provide "forward" linkages for other investments by, say, making intermediate products (inputs) such as fertiliser and agricultural implements less expensive and more readily available. Others provide "backward" linkages by expanding the market for a product. Each investment may be economically justifiable if other investments go forward, but not if considered on its own.

For example, the economic justification for clearing mines from agricultural land depends principally on the benefits accruing from future agricultural production on that land and on the clearance costs. Benefits are typically meagre in poor countries because agricultural productivity is low, while clearance costs can be very high because of logistical problems. So mine clearance in, say, a remote community in Mozambique may not be justified on purely economic grounds because costs are high and benefits low. However, if a feeder road is built to the community, it will cost less to get the mine clearance team to the village. If private traders then arrive to buy grain and sell fertiliser, local farmers may buy the fertiliser to produce more grain for sale, thus boosting agricultural productivity. If government extension agents then begin visiting to advise farmers on better agricultural practices, productivity will grow further. If the government has invested in agricultural research, extension agents can also bring improved seeds, boosting productivity even more. Over time, farmers will earn enough cash to buy cattle for animal traction, again raising agricultural productivity. Traders will come more regularly to buy grain, reducing on-farm storage losses, lowering transportation costs, and creating pressure on the government to maintain the road. A virtuous circle is built raising the community from its poverty trap to comparative prosperity.

The only question: how to create the virtuous circle? Because the community is so poor, perhaps none of the individual investments — by public works (feeder roads), traders (travel expense, maintaining the inventory of fertiliser, purchasing the truck), or farmers (buying fertiliser, enhanced seeds, and cattle, building storage bins, learning new practices) — is worthwhile on its own. Extension agents will not visit a village that is hard to get to and does not produce agricultural surplus. The government may not want to support research for a stagnant agricultural sector. The community remains trapped in poverty.

[8] The current favourite is the Sector Wide Approach to Programming (SWAP).
[9] For economists, a "trap" exists when there are two or more equilibria — say one at low income levels and a second at much higher levels — and no tendency for market forces to lead from the worse to the better.

A mine clearance task that might have a zero rate of return for a stagnant rural economy could have a annual return of 20 per cent if it is assumed the various complementary investments are made to lift the community from its poverty trap. Development experience to date suggests this would not be a safe assumption.

A way forward?

One of the reasons why horizontal co-ordination problems are so intractable in development management is that many different professions are involved, each with their own perspectives, methods, priorities, data requirements, and technical language. Typically, they also work for different agencies. Sometimes even communication across these professions and among the agencies seems too great a problem to overcome. Part of the appeal of programme logic models and logical frameworks is that, because they are straightforward, they establish a common focus and facilitate communication at a fairly basic level to solve vertical co-ordination problems. GIS promise similar benefits for addressing certain types of horizontal co-ordination — those involving spatial co-ordination, such as rural development. Why?

First, GIS offers a means for organising the storage and collection of huge amounts of varied data that shares one common characteristic: they exist (at least for a time) in some specific geographic space. The basis for organising this data is clear and readily grasped, regardless of one's technical background. Data can also be summarised and presented in a highly useful format — maps — with which virtually all are familiar. The results of data analysis can also be reported on maps; an excellent means for communicating even complex ideas. GIS and the related data analysis and mapping programmes represent a powerful set of tools that most development professions will be eager to employ. As this happens, they also become a common set of tools, and a basis for cutting across conceptual divides within the development community. In turn, this will make the planning and management of spatial co-ordination far easier.

This has already happened to a degree within the mine action community. People with very different backgrounds and perspectives have learned to work reasonably well together in the space of a few years. Mine action personnel are more familiar than most in the development community with using these new tools to integrate knowledge across technical fields. In a number of cases, mine action centres are producing maps for other development programmes and government departments. In some countries, mine action programmes developed the first national GIS system, which has led to common standards, simplifying data exchange in the future. In Kosovo, the MACC compiled the first district-level population estimates and distributed these to all development organisations. In Lao PDR, UXO LAO is now trying to obtain access to agricultural census data, which will vastly increase its capacity for socio-economic analysis. With this, UXO LAO will be able to analyse the size of agricultural holdings, average productivity, the percentage of households marketing rice, numbers of households with landholdings below a size threshold, and many other factors that might bear on clearance decisions, for all communities simultaneously. It will be able to search systematically for specific negative impacts associated with, and perhaps caused by, UXO contamination in severely affected communities. Future censuses will allow systematic comparisons of changes that have occurred in communities receiving mine action assistance, relative to others that have

not. Such evidence will vastly increase our understanding of the socio-economic impacts of mine action.

GIS systems also promise potent "network economies".[10] As more government agencies, NGOs, and businesses employ such systems, increasing amounts of information will be available to all with GIS capacities, typically at very low cost. For example, a mine action centre might be able to access the plans of all development NGOs to see what communities they are planning to work with, and when, greatly simplifying inter-agency co-ordination.

No one is certain where this will lead, but mine action professionals will benefit the development community greatly if they can capitalise on these opportunities to develop new analysis, planning, and management tools for spatial co-ordination.

[10] A positive network externality occurs whenever a new individual joins a network, because all existing members benefit. For example, in the early days of telephone, few people had them so a subscriber could not reach many businesses or friends. As more subscribed, ***those already on the network benefitted*** by being able to reach more people and businesses. The Internet provides similarly powerful network externalities. The MACC experience in Kosovo, where its eagerness to collaborate with other agencies has been frustrated because "most sector planning does not seem to have used any spatial or service area analysis" is a good example of the situation prevailing before network economies kick in.

Appendixes

Appendix 1

Case study of Kosovo

Background on Kosovo

Although Kosovo has a rich mineral and natural resource base and fertile agricultural land, it is generally agreed that the province needs substantial rehabilitation and modernisation. As a result of the spring 1999 conflict, industrial output collapsed and agriculture production plummeted, with livestock herds lost or killed and the planting season missed (IOM, 2000:1). In addition to repairing conflict-related damage, the effects of a decade of neglect have to be dealt with, and effective sectoral institutions and policies have to be developed (EU and World Bank, 1999:19).

Transition in Kosovo has to take place against the background of not only the legacy of Yugoslav-style planning and social ownership but also the constitutional peculiarities and political uncertainties of the present (World Bank, 1999a:3). Constitutionally, Kosovo remains within the Federal Republic of Yugoslavia, but following the end of the war between the regime in Belgrade and the North Atlantic Treaty Organization (NATO), the United Nations, through the aegis of the United Nations Mission in Kosovo (UNMIK), has become the *de facto* government of the province.

A study by the International Organization for Migration (IOM) found that half the total post-war population of Kosovo is under 25 years age, with 32 per cent younger than 16 years (IOM, 2000:16). Unemployment in the province is 50 per cent, with 57 per cent of the unemployed living in rural areas. The most common sectors of activity among those employed are agriculture, education, industry and mining, public administration, and trade (IOM, 2000:53). Illiteracy among those 10 years and older is 6 per cent, of whom 83 per cent are women. A total of 71 per cent of persons older than 14 years have completed elementary and high school; only 9 per cent have completed higher education (IOM, 2000:16).

International organisations (World Bank, 2000a; UNMIK, 2000) have identified three main challenges for Kosovo:

- To develop a thriving, open and transparent market economy, which can quickly

provide jobs to a large part of the population of Kosovo; this requires restarting the rural economy, encouraging the development of the private sector, and addressing the issues of public enterprises;

- To restart public administration and establish transparent, effective and sustainable institutions, with particular focus on setting up the central institutions that are key for economic recovery, developing municipal governance, and restoring law and order through an effective police and judiciary; and
- To mitigate the impact of the conflict and to start addressing the legacy of the 1990s, with a focus on restoring adequate living conditions (and in particular housing repair, local infrastructure rehabilitation, and landmine clearance), rehabilitating the infrastructure networks needed for economic development (telecommunications, energy, transport), and upgrading social service delivery (both education and health).

As IOM has noted: "Reliable demographic indicators are scarce in Kosovo. The absence of reliable demographic and health indicators hampers the rehabilitation efforts being undertaken by the international community in Kosovo. All agencies, institutions and organisations involved in humanitarian aid and development programs are experiencing difficulties in setting priorities and planning for the evaluation of their programmes. Furthermore, it is difficult to track population mobility as Kosovo slowly recovers from the very difficult period of the war" (IOM, 2000:1).

History of mine and unexploded ordnance contamination

In most mine-affected countries, the mine and UXO threat has been caused by years of warfare, resulting in an indigenous body of knowledge of the general location of minefields and their impact. In Kosovo, however, the overwhelming majority of the mine and UXO contamination occurred over a period of only a few months with most of the population displaced, either internally within the province or across neighbouring international borders. As a result, the principal source for information on mines and mine impact shifted from local inhabitants to external actors, especially NATO and mine action organisations and bodies.

In Kosovo, the mine and UXO threat comprises blast anti-tank mines, blast, bounding, directional and fragmentation anti-personnel mines, cluster bomb munitions (CBU), and other unexploded ordnance. By 2000, seven varieties of anti-personnel mines and eight types of anti-tank mines had been identified. A number of locally-fabricated explosive items combining mines or ignition systems with conventionally-configured explosive charges were also discovered.

The landmine threat comes largely from minefields laid by the Yugoslav Army, Yugoslav Police, and other paramilitary forces. Minefields were typically laid as border minefields, as large defensive minefields in the interior of Kosovo, and around avenues of approach (roads, trails). The Kosovo Liberation Army (KLA) also laid minefields. Nuisance mines or improvised explosive devices were also laid in and around houses, schools, villages, paths, and the like. There were two incidents where new mines were laid against members of the Serb community in villages outside Pristina. Three people were killed in these incidents.

The bulk of the UXO threat to civilians results from unexploded NATO cluster bomblets. Three different types have been found in the province. CBU strikes were typically targeted against military units and encampments, facilities and strategic infrastructure. There is also a significant number of other conventional UXO ranging from small arms ammunition and grenades to mortar and artillery shells and bombs.

History of mine action in Kosovo

The speed and size of the deployment of a wide range of mine action resources to the province of Kosovo are unprecedented in the history of humanitarian demining. In contrast to many other mine-affected regions, where years of mine laying and UXO contamination demand the commitment of mine action resources for decades, it is believed that only a few years will be needed to clear Kosovo of its mine and UXO threat.

Following the end of NATO bombardments and the United Nations's entry into the province, massive amounts of mine action capacity flowed into the region. Initially, this came in the form of military engineer and EOD units but was soon followed by a wide array of commercial and NGO mine action organisations. The ratio of clearance resources to contamination is probably greater in Kosovo than in any other mine-affected region in the world.

With the United Nations operating as the *de facto* government of the province, the MACC, located within UNMIK, has atypical powers over the operation of mine action in the province. This means that some of the lessons learned from the Kosovo experience may not be easily transposable to other mine action contexts.

Mine survey

The extent of the mine/UXO threat in Kosovo is relatively well known. In fact, the planning and analysis process suffers from an information glut but its use is hampered by the quality of the data and the resulting impact on its analysis. As a consequence, mine action faces two distinct yet interrelated challenges. First, detailed local surveys need to be undertaken to eliminate false, duplicate and overlapping records from the system: the MACC estimates that between 30 and 50 per cent of all the IMSMA database entries fall into one of these three categories. Second, all records must be prioritised in terms of clearance and mine awareness education. It was decided by the MACC that a Landmine Impact Survey was not appropriate in Kosovo owing to the huge concentration of resources within the province and the relatively short time needed to clear mines and UXO. However, the MACC identified the need to base their future plans on more than just mine location data, and as a result approved the concept of the modified Landmine Impact Survey as outlined by the SAC.

For Kosovo, IMSMA imported all records of minefields, UXO and CBU strikes as danger areas.[1] Each record was automatically assigned a number, based on its date of

[1] Under normal procedures of a sequential Landmine Impact Survey, (Level Two) Technical Survey and (Level Three) Clearance Certification, suspected mined areas would be entered as mined areas. Danger areas were intended to denote other dangers such as collapsed bridges, banditry, ambush sites, etc. The standard Landmine Impact Survey ties mined areas to villages and towns surveyed. Without the town/village survey, there was no way of entering the records as mined areas and so all records were entered as danger areas.

entry into the IMSMA. Upwards of seven separate data sets were combined to form the IMSMA danger area data set. The data for these records came from multiple sources and the approximately 4,000 records are of varying reliability.

Yugoslav Army records are the most accurate of available data sources, however the physical representation of these records is based on arbitrary safety buffers or polygons generally reflecting a grouping of smaller minefields. These records consist of paper drawings of minefield plans completed by the Yugoslav Army mine laying unit and which were handed over to the United Nations Kosovo Protection Force (KFOR) in accordance with the Military Technical Agreement. KFOR also provided GIS layers of polygons and map points based on the co-ordinates of the centre of mass of the minefield. These two types of documents, though, do not always coincide. In addition, some rather less accurate maps were provided of minefields laid by the Yugoslav Police, paramilitary forces and reservists. Although a large number of these records have been entered into the IMSMA, the process is time consuming.

NATO records imported from KFOR include two main types — cluster bomb strikes and all others:

- Cluster bomb data is based on point target data (i.e., the intended target) and not the actual point of impact. The actual pattern of contamination is dependent on factors such as altitude of the drop, speed of the aircraft and the vector or direction of attack. The pattern of contamination should generally be an ellipse 300m wide by 500m long, and oriented to the direction of travel of the aircraft. NATO has only released the number of CBUs dropped and the targeting co-ordinates.[2] Hence data in IMSMA does not necessarily represent the actual contaminated area on the ground. The official estimated failure rate for the bomblets varies from 5 to 10 per cent depending on the source. Clearance of cluster strike areas involves locating and destroying in situ the unexploded sub-munitions. Minefield clearance assets are not used for CBU clearance, which is achieved through "battlefield area clearance" (BAC) for items of surface and sub-surface UXO.
- All other NATO records include minefield, UXO and other reports that were collected by NATO or reported to it in June and July 1999 prior to the MACC taking over management of the IMSMA database. In January 2000, when the case study was originally drafted, KFOR was entering its third troop rotation. The resulting loss of institutional memory between rotations has made it more difficult to find out why certain records were originally entered as well as to determine the status of areas reported cleared. Also problematic is the limited reporting of independent clearance by KFOR contingents. In many cases, KFOR troops have cleared areas independent of a tasking by the MACC, resulting in many danger area records remaining in the system even though the areas are in fact clear.

The HALO Trust, a British mine clearance NGO, undertook a rapid survey of mine and UXO contamination in June and July 1999, using portions of the IMSMA Landmine Impact Survey format. These records were entered into IMSMA without cross verification with other records. The limited socio-economic data collected was of negligible value. This was due to the fact that many refugees were still in the process of returning at that time and so the information was too incomplete to provide a sound basis for planning.

Other reports include information provided by NGOs, returning civilians, and older records from the 1998-1999 Kosovo Verification Mission/Kosovo Disengagement Observer Mission. Few, if any, of these records were verified prior to entry into the IMSMA database. It was completely impractical to do this given the emergency nature

[2] After the original submission of the case study, NATO provided additional information regarding the use of cluster bombs and the location of cluster bomblets.

of the programme, and a conscious decision was made to err on the side of caution, rather than withhold information that could potentially save peoples lives.

Most of the above-mentioned records were imported wholesale into IMSMA in July and August 1999. Others were progressively consolidated into IMSMA from August to November 1999. A difficulty faced when entering and/or verifying records has been the imprecision in recording danger areas. Reasons range from a standard Global Positioning System (GPS) error of ±100m to individual map reading errors by the observer/recorder. IMSMA plots each entry as a separate record, yielding a GIS layer of multiple overlapping contaminated zones. It is suspected that many of these records are duplicates or false reports (MACC estimates these to be 30-50 per cent of the total), and they are often referring to the same area but are offset by 10-100 metres dependent on observer position reporting error.[3] Using GIS functions the SAC estimated the total mine/UXO contamination problem in Kosovo as covering some 360.97 square kilometres. On the basis of a 30-50 per cent rate of duplication and false records, particularly cluster strike areas which heavily overlap, the physical area within Kosovo to be cleared will be substantially lower than the estimated composite contaminated area.

Mine marking and fencing

International mine clearance NGOs and companies began minefield and UXO fencing and marking during the second half of 1999, while KFOR concentrated on the fencing and marking of CBU strike areas. KFOR has also been a principal procurer of marking and fencing stores received and managed by the MACC.

Most of the larger NGOs have their own marking stores and signs and limited marking and fencing maintenance occurred over the winter of 1999-2000. Since colours and patterns vary quite widely, samples are collected for distribution to mine awareness educators. Initial problems were encountered with mine signs being removed or defaced due to the use of Cyrillic Serb lettering. An attempt was made to correct this during the winter 1999-2000 with the procurement of signs using English, Albanian and romanised Serbian. But as of February 2000 not all the signs had been removed, although some ethnic Albanian mine awareness teams were crossing out the Serb phrases and words.

Mine clearance

As mentioned above, the total estimated contaminated area in Kosovo is some 361 square kilometres. This represents 3.32 per cent of the total landmass of the province. Clearance figures (as reported to the MACC) for the seven months to the beginning of the 2000 operating season are summarised in Tables 1 and 2.

The clearance season in Kosovo runs from March to November. Freezing weather, limited daylight, snow and ice all make sustained clearance during the winter impractical. At the end of 1999 the MACC had accredited 17 mine/UXO clearance organisations, including both humanitarian NGOs and commercial companies. These organisations have recruited and trained a total of 600 local deminers. The MACC

[3] For example, some areas were cleared based on a tasking from the MACC of a specific record number. The clearance report submitted to the MACC, which delineates the physical area cleared, does not physically correspond to the co-ordinates of the suspected area record.

expected the number of clearance organisations to reach 16 for the 2000 clearance season. Mine clearance in Kosovo is undertaken by manual and mechanical means, and by explosive detection dogs.

Table 1: Explosive items cleared as at 1 February 2000

UXO	Cluster bomblets	Anti-personnel mines	Anti-tank mines
8,475	2,743	2,430	2,319

Source: UNMIK-MACC, 2000a. These figures do not include clearance by KFOR.

Table 2: Land cleared in square kilometres (does not include nuisance mines)

Estimated area	Sq. Km.	Per cent of total area
Total contaminated land[a]	361	100
Area physically cleared[b]	2.3	0.6
Area cleared by reconnaissance[c]	2.2	0.6
Area left to clear	355.5	98.8

[a] Includes estimated safety buffer zones.
[b] Does not include safety buffer zones.
[c] Includes estimated safety buffer zones.
Source: UNMIK-MACC, 2000a. These figures do not include clearance by KFOR.

While 1999 clearance progress was slow, the MACC expected to make significant progress in 2000. It is expected that very significant gains will take place through a concentrated survey effort aimed at eliminating false and duplicate records. Indeed, it is conceivable that the estimated composite contaminated area of 361 square kilometres could be reduced to an area of not more than 240 square kilometres once these records have been eliminated. Thus, with a sustained commitment of resources, the MACC believes that Kosovo can be cleared within two to three years.

During the chaotic period following the international community's entry into Kosovo, mine/UXO clearance efforts focused mainly on responding to requests from relief and reconstruction agencies and the civilian population. This approach was not the best application of resources from a strictly mine clearance perspective, but proved to be the only option given the high visibility of large concurrent relief and resettlement activities and the mine action community's lack of a definitive provincial workplan prioritising danger areas for clearance.

The largest of these requests involved surveying and clearing 776 schools for the United Nations Children's Fund (UNICEF) and the ongoing clearance of access routes for the repair of electrical power distribution pylons for donor-funded contract firms. Many additional tasks resulted from requests from civilians to clear suspected mines/UXO from more than 16,000 houses and gardens.[4] In fact, these additional tasks, which

[4] A total of 16,111 as at February 2000.

were not linked to a specific danger area, often did not require actual clearance (other than of a few items of UXO) and served more as a confidence-building measure. These requests can, in part at least, be attributed to improved public knowledge by the mine awareness programmes in the refugee camps prior to return.

NATO military resources have also contributed to clearance efforts. Although KFOR is officially mandated only to clear those mines and UXO that obstruct its mission, KFOR EOD personnel also responded to requests for the clearance of other mines and UXO. From June to December 1999 KFOR cleared most primary and secondary roads as part of their mission; additional road clearance was undertaken as required.

Initially, a critical constraint on the clearance effort was the lack of available explosives to destroy the mines and UXO. Mine/UXO clearance organisations were prevented from procuring or transporting explosives into Kosovo. Some organisations resorted to dismantling mines for the explosives. After much hesitation and donor government negotiation, some KFOR contingents agreed to store and sell explosives to MACC accredited mine/UXO clearance organisations.

A second major constraint on mine clearance was the lack of sufficient quality assurance capacity. Recognised as a MACC function, the funding and contracting arrangements took some time to arrange and a fully-functioning quality assurance capacity was not due to be deployed until March 2000. This does not include post-clearance verification of land use.

The Yugoslav Army has committed to provide mine clearance assets under the supervision of KFOR to clear those areas they had previously identified. Under the Military Technical Agreement signed with NATO, KLA certified by memorandum that they had cleared their minefields. No records were provided by the KLA regarding the actual locations, hence neither confirmation nor quality assurance was possible.

A number of individuals have also cleared mines and UXO. The more successful of these confirm that they have turned over the removed ordnance and mines to KFOR. The less successful have probably contributed to the large number of casualties in the category of males aged 15 to 24. Mine awareness education programmes have included the message that any discovered mine or UXO be reported to KFOR, mine clearance organisations or to the KFOR Civil Military Cooperation Center.

Mine victim assistance

Between June 1999 and January 2000 there were some 235 mine/UXO incidents in which 92 persons died and others sustained injuries ranging from minor wounds to traumatic loss of limbs. Table 3 below shows the monthly counts of incidents. Victim assistance is tracked through two complementary processes. The IMSMA includes a comprehensive victim and incident recording system that allows such data to be overlaid on maps showing geographic features and contaminated areas. The International Committee of the Red Cross (ICRC) assists the MACC in this process. The ICRC has made a conscious effort to track down all surviving victims and families. the World Health Organization (WHO), ICRC and health NGOs also maintain a casualty surveillance system based on reporting from health facilities.

There are, however, a number of remaining gaps in the data set with many victim records devoid of any clarifying details.[5] Concerns have also been expressed as to the quality of the data gathering and entry process. The US Centers for Disease Control have provided assistance to WHO and ICRC on improving the data collection and analysis process. About the only conclusion that could be drawn for the available data was that males between the ages of 15 and 24 appeared to have the highest frequency of being involved in a mine/UXO incident. Analysis performed by the SAC using GIS algorithms and statistical regression drew a positive and significant correlation between the frequency of victims and the overall contamination rate of the district in which the incident occurred. Table 3 shows the absolute number of incidents by month of occurrence and qualified by the time frames for major population movement.

Table 3: Recorded Mine Incidents (1999-2000)

Refugees returned	June	87
	July	69
More settled conditions	August	31
	September	24
	October	12
	November	7
	December	3
	January	2
	TOTAL	**235**

The victim assistance community in Kosovo acknowledges the near complete lack of social and health support service for victims and their families. The lead agency for victim assistance is WHO. Along with the ICRC and a number of NGO partners such as Handicap International and the Mother Theresa Society, WHO is developing the means to provide comprehensive medical and rehabilitation care to mine victims. However this will take some time, as much of the public health system and services had deteriorated over a number of years and will require considerable effort to be upgraded.

In order to address these shortfalls, Handicap International has established a prosthetic production facility. KFOR provides evacuation by ambulance and helicopter to facilities in Kosovo or the Former Yugoslav Republic of Macedonia, as well as body recovery. In addition, the Vietnam Veterans of America Foundation (VVAF) has embarked on victim assistance programmes aiming to provide psycho-social services to help victims and family members identify needs and seek additional help. The programme also assists in the reintegration of victims into educational and economic activities. The MACC has recognised its own need for victim assistance analysis and co-ordination capacity.

Mine awareness education

ICRC, UNICEF and MAG undertook mine awareness education in refugee camps in Albania, Macedonia, and Montenegro. The efforts resulted in people being aware of the danger posed by mines and UXO in areas to which they would be returning. This

[5] A complete survey of mine victims has now been completed for the MACC by VVAF to address concerns surrounding victim data.

was borne out by the heavy demand on house clearance by returning Kosovo Albanians, whether or not there was actually any danger present.

In 2000 mine awareness education in Kosovo was carried out by 17 organisations as well as KFOR. There is some overlap between mine clearance and mine awareness organisations. The MACC co-ordinates and accredits organisations to work in Kosovo and exercises a mandatory review and certification of all MAE materials to be used.

The main mine awareness programmes that are being implemented are community-based activities which include the "Safer Village"[6] concept and the child-to-child programme, which is supported by an EOD team to undertake immediate UXO clearance tasks along with the identification and marking of "child safe areas". The Safer Village concept looks at the specific needs of a village and tries to provide an alternative solution to risk-taking behaviour. The child-to-child programme (at least as it is implemented in Kosovo) focuses on the child as a trainer of other children and parents in the home using traditional games and activities. Already there have been occasions when children have used the information passed to them during the child-to-child training to report cluster bombs and UXO to a responsible adult/community member or KFOR representative.

Summary of future mine action needs in Kosovo

In its 1999 Donor Conference report, the MACC identified the need for specific resources for the calendar year 2000. These include an Impact Survey and Technical Survey capacity; responsive and programmed mine clearance capacity; cluster-strike marking, survey and clearance; and EOD and mine awareness education teams.

In addition to the benefits of area reduction as a precursor to mine clearance activities, a Technical Survey capacity is an essential component of any mine action programme. Invariably, a number of mined areas are not deemed to be an immediate priority for clearance, yet still require some action to be taken. Presently there are approximately 2,000 reports of such areas within Kosovo. As an absolute minimum, mine awareness education should be provided to the local community in these areas; a preferred option, though, is to conduct a Technical Survey as well, which may or may not incorporate area reduction. Technical Surveys have been used extensively in 2000 by teams contracted by the MACC and have targeted small mined areas that do not warrant deployment of full mine clearance teams.

The MACC objective to clear unexploded cluster bombs from the province as soon as possible will continue during 2000. In April 2000, the approach to remove the threat by destroying both the surface and sub-surface UXO in the priority areas was changed to focus on instrument-assisted surface clearance in the first instance, with sub-surface undertaken at a later date. The rationale behind this change was to quickly remove the immediate hazards that were easily accessible to the local population. The exception to this approach is when the land is to be used for agricultural purposes and is to be ploughed — a sub-surface search is conducted in the first instance. Teams have been identified to quickly follow on from KFOR survey and marking teams to ensure that strike areas in close proximity to local populations are cleared expeditiously. Clearance

[6] "Safer Village" is an ICRC term. However its general principles are replicated in the overall community mine awareness programmes.

teams tasked to clear CBUs are also capable of other types of BAC, which may be necessary in some areas (e.g., around defensive positions where fighting took place).

Individual items of UXO such as bombs and grenades will continue to be discovered throughout Kosovo for some time to come. As these items are reported, a responsive EOD capability is required in order to maintain confidence and minimise risk to the local population. In some cases the EOD teams may form part of the integral capability of mine or cluster clearance teams. It is expected that EOD activities will continue in Kosovo long after most traditional demining and battlefield area clearance has been completed.

Actual areas of contamination as confirmed by reconnaissance or Technical Survey require marking and fencing. As surveys further refine the actual areas contaminated, marking and fencing will take on greater importance. To some extent, area reduction and clearance will occur simultaneously.

In terms of victim assistance, it will be important to bolster the existing prosthetic support capability and to introduce a basic psycho-social and advocacy support network to assist with the reintegration of mine/UXO victims in the workforce or school system. This should be co-ordinated through WHO, ICRC and various NGO partners, in conjunction with the MACC.

Human, social, economic and environmental impact and indicators

Overview of needs assessments

With the return of the international community to Kosovo in June 1999, most United Nations agencies and NGOs began to carry out needs assessments. However, none of these assessments directly addressed the impact of mines and UXO. In the light of the wealth of information available, the SAC and the MACC agreed that there should be a way to integrate these sector assessments with the MACC's abundant mine/UXO data. The methodology used to accomplish this task is described later.

Analysis of the use of socio-economic indicators

The basis for the prioritisation methodology used by the SAC and the MACC links a public safety/hazard analysis and Landmine Impact Survey based on geographically-defined areas. It was reasoned that civilian populations go about their social and economic activities in a geographic space. When parts of these socio-economic spaces are denied, due to contamination by mines/UXO, normal activity exposes the population to greater risk of death or injury. By selecting certain activities and defining the physical boundaries as "essential livelihood space" it is then possible to identify those contaminated areas that pose the greatest threat.

After generating a GIS model of the essential livelihood space it is possible to attach values based on social and economic assistance programme priorities. International relief and reconstruction assistance programmes determine project priorities based on sector-specific criteria. Depending upon the focus of the given programme, these sector priorities are usually assigned by town/village, municipality or geographic

region. By compiling the sector priorities for relief and reconstruction resource allocation, it would be possible to identify the relative geographic concentration of such resources across all of Kosovo. It was reasoned that towns and villages in areas with a heavy concentration of relief and reconstruction activities would have a higher demand on mine action services.

Analysis of the views of the local population

Limited sampling of the views of the local population has occurred. Their concerns are most visible in the self-reporting of suspect contaminated areas to KFOR and requests for house clearance. The extensive mine awareness efforts have sensitised a significant portion of the population to the danger presented by mines and UXO. Agricultural assistance NGOs have also reported that many of their beneficiaries are concerned about the potential contamination of their land, especially considering that the policy was not to give resources to farmers with contaminated land. The local population suspects areas to be contaminated if it was known that a Yugoslav military, police or paramilitary force had been in the area.

Existing criteria for the prioritisation of mine action

Concept

The MACC required the ability to prioritise the handling of each danger area record as well as establishing a relative impact measurement based on a social/administrative unit. To accomplish this the MACC has addressed mine/UXO-contaminated areas (IMSMA Danger Areas) in two separate ways. First, each record in IMSMA was given a priority score for further survey and/or clearance. Hence, the prioritisation mechanism would guide the reconnaissance process and the clearance process. Second, in order to develop a relative measure of impact, total suspected contaminated land needed to be estimated in a way that eliminated the double counting of duplicate and overlapping areas. The process did not have to account for false and duplicate records because the MACC was undertaking a deliberate confirmatory reconnaissance process to eliminate these records and define what was actually contaminated. This process would result in a cleaned data set of minefields under the IMSMA Technical Survey format. The new data set would then provide the basis for 2001 work plans.

Drawing on interviews with MACC staff, other mine action organizations, humanitarian NGOs and other United Nations agencies, SAC defined a concept of "essential livelihood space", where most social and economic activities would take place. This same space would also be the location of most point-of-service specific relief and reconstruction projects. As defined, the essential livelihood space comprised the area within a 500-metre radius of a settlement and 200 metres either side of a road. Added to this area analysis were agricultural land and wood foraging areas. Agricultural land was drawn by hand in the GIS using satellite imagery. Wood foraging areas were defined as those areas of dense vegetation that intersected the social space buffer. As a total measure, the essential livelihood space equated to roughly 40 per cent of the total landmass of Kosovo. It was initially envisaged that the sector priorities would be spatially assigned to various nodes in this network. However, such priorities had yet to be established by the responsible international authorities prior to the completion of the analysis.

Considerations

All minefields, cluster bomb strikes and other mine/UXO-contaminated areas were imported into IMSMA using the "danger area" field. The danger area field was not intended for the purpose of managing minefield/UXO clearance. In this regard, IMSMA-managed danger area files only discriminate between cluster bomb strikes and all others. MACC understands that "all others" includes false records, UXO and mined areas. However, pending reconnaissance, no reliable information exists to further break down the "all other" category. Dangerous area size data is generally not reliable prior to confirmatory reconnaissance because polygons and circles were assigned arbitrarily.[7] Many records, notably cluster strikes,[8] are overlapping and a number of seemingly distinct records may actually relate to the same areas.

The first step in the process was to select only those records that fell within the borders of Kosovo. Excluded records from the previous 12 months included those in Albania, the Former Yugoslav Republic of Macedonia, and the Federal Republic of Yugoslavia areas of Serbia and Montenegro. This process yielded 518 CBU strikes and 1,408 minefield and UXO areas.

The second step in the process was to give an area to cluster strikes, which had only been recorded as points. Given the lack of data the contaminated area required an estimate. The IMSMA database had initially been set to give the CBU strike an area based on a 300-metre radius circle. SAC considered this estimate inadequate given the potential physical dimensions of the footprint and increased the area to a circle of 500-metre radius.

Similarly, incident reports and particularly data on incident locations were deemed unreliable because they were incomplete or very imprecise. Population data is available, but had to be patched together from different sources, and does not include the numbers of internally displaced persons. These factors make for high levels of statistical noise. It is expected that the validation of any scoring model will be weak before the confirmatory reconnaissance process has been completed and has been translated into IMSMA.

The priority scale

Based on data analysis, and discussions with MACC staff, mine/UXO clearance organizations and mine/UXO awareness organisations, a scale was established. The resulting scale used for scoring dangerous areas is a proximity scale modified with land use variables. An additive form was chosen because the danger areas can overlap a combination of the various elements — town buffer, road buffer, agricultural land, wood foraging. Table 4 shows the arguments that enter into the score classification, while Table 5 shows the resulting classification brackets.

Not all of the values are used for individual dangerous areas. It should be noted that "zero" does not mean free from contamination. Zero stands for a dangerous area entirely contained in marginal land, notably mountains and forests outside agricultural land.

[7] In some cases the discovery of unexploded mortar rounds prompted the original collector to place a 300-metre radius circle as the danger area.

[8] A notable example is the map depiction of a single cluster strike symbol, which when queried through the GIS pulls up 15 separate strike records.

Table 4: Weights for Danger Area Prioritisation

Argument	Points added
Dangerous area intersects with town buffer	10.0
Intersects with road buffer	5.0
Intersects with agricultural land	2.0
Intersects with wood foraging area	1.5
Maximum	18.5

Table 5: Priority Score Brackets

Priority	Score bracket
Low	0 - 3.5
Medium	3.6 – 9.9
High	10 - 18.5

Given the way the bounds were set, a dangerous area cannot become high priority unless it intersects with a town buffer,[9] and it cannot be medium priority unless it intersects with a road buffer. The consequence is that dangerous areas in agricultural land but not touching any buffer are all set to low priority. Given that the agricultural land layer includes both cultivated land and pastureland, those danger areas intersecting solely the agricultural land feature are most likely in remote pasturage. The agricultural and wood foraging scores contribute to making finer graduations within a priority group.

The scale was validated against two external criteria: potential to reduce incidents, and priorities set by others. The latter relies on the siting of community mine/UXO awareness education as decided by other organisations and their local staff. The scale performs well on both.

Estimating district impact

The traditional Landmine Impact Survey uses the community as the unit of analysis. However, community level data in Kosovo existed at less than 50 per cent coverage. The next meaningful level where population data could be compiled for a near 100 per cent coverage was the district. Smaller than the municipality, the district provided a useful administrative and geographic unit for comparative analysis.

SAC estimated the total contaminated area as a means of defining the Kosovo-wide problem and as a tool for estimating relative levels of contamination among municipality and district administrative units. The bases of the SAC summary were the IMSMA tables for CBU strikes and danger areas that were completed on 28 November 1999. These tables are known as cluster and non-cluster respectively.

The ranking maps districts using the simple percentage of total area contaminated. This measure was highly predictive for potential incidents. Categories could be formed using different bounds. SAC chose to use a simple scheme based on the median value. The median value identifies the middle value in a list of values. In this way the gradations are not influenced by the extremes of high and low values. The median value of contamination for 327 districts in Kosovo was 1.3 per cent. The proposed scale is shown in Table 6.

[9] According to the SAC, the term town and village are used interchangeably with regard to the prioritisation process.

Table 6: Scale of district contamination impact

Degree of contamination	Definition	Number of districts	District area as per cent of total Kosovo area
No contamination	Zero, for no contamination	99	25.01
Low	Up to the median (0-1.3%)	65	23.14
Medium	Between 1 and 5 medians (1.3%-6.5%)	92	31.28
High	Greater than 5 medians (6.5%-29.8%)	71	20.49

The resulting ranking of districts by mine impact severity, or mine hazard strength, while immediately useful for prioritising mine/UXO awareness activities is of limited practical use as a tool for mine/UXO clearance. If sector rehabilitation plans become firmer and more clearly defined in spatial terms, closer integration can be achieved by means of the district classification.

Assessment of the role of socio-economic indicators in planning

Data collection, reliability, availability, suitability and completeness are major constraints. Many data sets collected by outside institutions, including other United Nations agencies, were available but not easily joined on a common reference. These problems required significant manual manipulation of spreadsheet-formatted data sets. To this end the MACC initiated a number of inter-agency meetings aimed at rectifying data standards. It was foreseen that a survey relying on other organizations' data would increase the vulnerability of the analysis to the failure or tardiness of others to produce basic data. Indeed, securing the basic data was an effort requiring much persuasive diplomacy. Once acquired, the data underwent significant cleaning and rearranging and processed through advanced linking, querying and analysis outside of IMSMA using GIS algorithms. But as a result of the various constraints, the analysis was greatly reduced in scale using fewer variables.

Although the methodology described above provided for the incorporation of socio-economic data, such provision was premised on the reconstruction and development community having well-defined and geographically-prioritised programmes. At the time SAC was developing the methodology, neither the lead sector agencies, nor the European Commission, nor UNMIK's Civil Administration had developed such priorities. Of the main social and economic reconstruction sectors (health, education, agriculture, water, public utilities and resettlement), only agriculture had come close to a priority scheme.

The Food and Agriculture Organization (FAO) set the initial agricultural assistance priorities based on a relative ranking of municipalities using the 1999 harvest as a percentage of the 1997 harvest. However, with one sector available, incorporating only the agricultural priorities would have skewed the overall mine/UXO clearance

prioritisation towards agricultural needs only. As the MACC planning process was drawing to an end, the FAO brought in a consultant to undertake a more in-depth socio-economic impact study of the agricultural sector. The MACC provided FAO copies of the GIS map layers of composite contaminated land, agricultural land use as well as the district administrative units with population estimates. With these tools, it is hoped that FAO's new priorities will be easily joined with mine impact area analysis for establishing priorities.

Although the education and health sectors had maintained master lists of facilities by location, these lists were not prioritised for funding but simply maintained for would-be donors on an *ad hoc* basis. Moreover, the locations of the facilities were rife with spelling errors and freely used either Albanian or Serbian names. Sorting out these lists would have taken a significant amount of time and effort. Public utilities planning was even more haphazard. Projects were initiated with little or no notice and tended to depend on donor government decisions on funding. As an example, MACC support for clearing access to electrical power transmission pylons and sub-stations was conducted without a master plan ever being assembled by the co-ordinating bodies. Consequently, some mine clearance actions were not matched by the appropriate inputs from other sectors and overall rehabilitative efforts were not achieved or were delayed.

The Office of the United Nations High Commissioner for Refugees (UNHCR) had promoted a logical system of positional codes for populated places in Kosovo. KFOR, the World Food Programme (WFP), FAO, UNMIK civilian police, and the MACC adopted the system. The Organisation for Security and Cooperation in Europe had also adopted the system and were looking to expand the detail coverage to be sufficient for civil registration and elections planning. Of particular note, there was little to no inter-agency sharing of critical population information. Indeed, a local population estimate at a level below the municipality only existed as a result of the SAC manually compiling population estimates from WFP, UNHCR, and the European Commission International Monitoring Group. SAC distributed the products of its analysis, including the only GIS map of agricultural land, to all organisations. By distributing this data the SAC sought to encourage other sectors to use the smaller and more useful geographic unit as the basis for planning and prioritisation.

Without the relevant sector rehabilitation priorities the prioritisation analysis is essentially an accident hazard analysis, not a socio-economic impact analysis. If sector rehabilitation plans become firmer and spatially more clearly defined, district classification can be used to bring about greater integration with those efforts. If this occurs, the concept of the essential livelihood space, and the ranking of districts by degree of buffer contamination, will also become more relevant. Since SAC made the district GIS files and population tables available to other lead sector agencies, such an outcome may not be too far off.

Existing criteria for measuring the benefits of mine action

The immediate objectives of mine action are to save lives and restore livelihoods. In this regard, the dramatic drop in mine incidents from June1999 to January 2000 can in part be attributed to effective mine awareness education in refugee camps and through a learning function taking place in communities of refugees repatriated to Kosovo. It may also be attributable in part to the onset of winter. If, as seems to happen, incidents

rise along with warmer weather, then these incidents should be analysed separately from the 1999 caseload for risky behaviour patterns. The priority clearance plan incorporates the public safety/hazard reduction concept.

By prioritising clearance areas close to essential livelihood space, it is hoped that measuring the areas cleared will have a direct relationship to removing barriers to economic and social development. Also, such work can be used to establish links to other rehabilitative activities to ensure that all required inputs are available to support land once it has been cleared. Integration allows for prioritisation and synchronisation of inputs, leading to overall cost savings and optimum outputs.

Other than these factors, the major objective of mine action programmes for 2000 is to reduce suspected areas of contamination into a discreet set of known contaminated areas, then mark and fence them.

The funding picture

It appears that donors committed more than US$28 million in 1999, with another US$32 million or more in 2000. These figures do not reflect the very significant contributions made to mine clearance and mine awareness activities by various contingents within KFOR (e.g., clearance of major and secondary roads). KFOR will continue to assist, including surveying and marking of cluster bomb sites and monitoring the clearance, by the Yugoslav army, of the minefields they laid.

The funds provided and committed appear to meet, or perhaps exceed, MACC's estimate of US$30 million required from January 2000 to December 2001[10] (plus US$4.5 million for "operating expenditures", apparently to cover local expenses for the Kosovo Protection Corps, the local organisation that will assume responsibility for mine action).[11]

Existing integration within development initiatives

The Kosovo Provincial Works Plan allows for integration with development work. However, at the time of plan formulation no development or reconstruction sectors had a well-defined prioritisation plan. When such plans become available, the MACC will be able to integrate these priorities into the mine/UXO clearance priority scheme. The structure established for mine action prioritisation is based on a strong spatial analysis. Given that relief, reconstruction and development programmes physically locate their project activities in a known location, the system can accommodate these priorities and perhaps anticipate them.

Except for the agricultural sector, no sector had a spatially-defined mechanism for establishing programme priorities. Although the United Nations' Humanitarian Community Information Center had been funded and provided with GIS software and computer equipment, this resource was not used to its full potential. Many agencies acknowledge that spatial planning units exist, such as health facility catchment areas and school districts. But most sector planning does not seem to have used any spatial

[10] EU and World Bank, 1999:94.
[11] UNMIK, 1999:9. The total budget for the Corps in 2000 is DEM 20.7, with about 52 per cent going to wages and the rest to "goods and services".

Table 7. Funding for Demining in Kosovo 1999-2000[a] (in US dollars)

Mine Action Function/ Organisation	1999 Amount	1999 Funding agency	2000 Amount	2000 Funding agency
CLEARANCE[b] (FIRMS)				
• BacTec	1,129,034	UK	1,936,000	UK
• Defense Systems Limited	2,206,601	UK	4,307,782	UK
• EMERCOM Demining	?	Switzerland	?	Switzerland
• European Landmine Solutions	?	?	3,520,000	UK
• Gerbera	?	?	?	?
• Greenfields	1,601,227	UK	?	?
• International Demining				
• Alliance Canada	$868,170	Canada	1,884,400	Canada
• MECHEM	?	?	?	?
• Mine Clear	?	?	?	EU
• MineTech	201,900	Canada	?	?
	?	UNHCR, EU, Belgium	?	?
• RONCO	?	US	?	US
Wolf's Flat/CIDC	355,344	Canada	?	?
CLEARANCE[b] (NGOs)				
• HALO Trust	2,986,080	UK	889,020	Denmark
	350,000	Switzerland	800,000	UK
	185,000	Germany	350,000	Switzerland
	460,000	Ireland	?	Ireland
	460,000	Netherlands, AAR	?	AAR (Japan), Czech
	?	(Japan), Pro Victimis, Czech Republic, US		Republic, US
• Handicap International	500,000	Switzerland	133,300	Switzerland
	160,000	France	50,000	Luxembourg
	240,000	EU (ECHO)	460,000	EU (ECHO)
• HELP UDT	240,000	Germany	300,000	Germany
	?	US	?	US
• InterSOS	?	Italy	360,000	EU (ECHO)
• Mines Advisory Group	554,852	UK	413,585	UK
	?	World Vision	$350,000	EU (ECHO), World Vision
• Norwegian People's Aid	3,125,000	Norway	2,272,727	Norway
	1,800,000	Finland	1,200,000	Finland
• Potsdam Kommunikation	360,000	Germany	300,000	Germany
• Swiss Fed for Mine Clearance	?	?	387,000	Switzerland
CLEARANCE – OTHER				
• UNHCR	1,500,000	Japan	?	?
• To various recipients			7,102,250	US
• UNMAS/KMACC/ITFs[c]	5,270,431	Belgium, Canada, Denmark, France, Germany, Luxembourg, Netherlands, Norway, Sweden, Switzerland, UK, EU	4,630,229	Australia, Canada, Germany, New Zealand, San Marino, Spain, UK
MINE AWARENESS				
• Adventist Development and Relief Agency	?	?	?	?
• Aid Without Borders	?	?	?	?
• Balkan Sunflowers	?	?	?	?
• CARITAS	?	?	?	?
• Danish Church Aid	1,511,346	Denmark	697,085	Denmark
• International Committee of the Red Cross	?	?	?	?
• Islamic Relief World Wide	?	EU	?	EU

Mine Action Function/ Organisation	1999 Amount	1999 Funding agency	2000 Amount	2000 Funding agency
• Mines Awareness Trust	?	?	?	?
• Save the Children	?	UNICEF	?	UNICEF
• UNICEF	?	?	?	?
• Vietnam Veterans of America Foundation (VVAF)	?	EU	?	EU
VICTIM ASSISTANCE				
• Association to Aid Refugees (AAR-Japan)	383,333	Japan	?	?
• Queen's University	$336,500	Canada	?	?
• WHO	?	?	?	?
• To various recipients	1,000,000	US		
GRANT TOTAL[d] (of which)	More than 28 million		More than 32.3 million	
UNMAS-MACC-ITF	5.27 million		4.63 million	
CLEARANCE[b]	More than $19.3 million		More than $27 million	
MINE AWARENESS	More than $2.65 million		$700,000	
VICTIM ASSISTANCE	More than $720,000		?	

[a] Funds shown are commitments and do not necessarily reflect final expenditures incurred in the year.
[b] Clearance includes "integrated mine action" and therefore may include some mine awareness and victim assistance.
[c] There may be some double counting of funds going first through trust funds and then to a mine action operator.
[d] Not including significant clearance and mine awareness activities undertaken by various contingents of KFOR.
Sources: Mine Action Investments Database (<http://webapps.dfait-maeci.gc.ca/mai/frameset.asp>); ICBL, 2000.

or service area analysis. Estimating relative access to services and projecting future needs would seem to be the most logical approach to allocating limited resources. Requests by the MACC to have access to such information for incorporation into the mine action planning process did not generate a useful level of data.

Recommendations

1. Relief, development and reconstruction programmes need to make a greater effort at deliberate planning. Where possible these should include spatial measurements for allocation of resources.

Mine/UXO clearance is a slow process at best. Concentrated reconstruction requirements create competing political demands on priority of service. In Kosovo little to no deliberate planning has occurred among development and reconstruction organisations regarding defining sector problems and sequencing planned interventions. More thorough inter-agency planning, which accounts for constraints and sequencing requirements, can improve integration of mine action with programmes addressing socio-economic factors.

2. Common survey requirements should be consolidated in an inter-agency process to reduce duplication of effort and promote a common data standard.

Socio-economic mine action analysis shares with other relief and development activities a common requirement for good data. Current practice is for each organisation to undertake its own surveys and analyses, frequently duplicating what other organisations may have already collected. In a shift from this cycle, the MACC and SAC showed that an information-sharing regime could work and deliver reliable analysis.

3. Efforts should be made during emergency operations to look beyond narrow organisational mandates and give attention to establishing and sharing data and GIS resources useable to all.

Programmes in the relief and reconstruction environment do not operate in a vacuum. All programmes, regardless of degree of specialisation are inter-dependent. Understanding, acting on and integrating the explicit and implicit requirements resulting from this interdependence can lead to greater programme coherence, inter-agency co-operation and economies of scale.

4. Using information technology as a planning and management tool reaches well beyond the mine action community.

The Kosovo Provincial Mine Action Works Plan demonstrated that IMSMA-based analysis is a highly relevant tool for planning and co-ordinating mine action and that an investment in information and analysis could make a major contribution to coherence and credibility of operational programmes. A precedent has also been set in using information technology to outline and predict how resources can be better applied in mine action programmes.

5. Mine clearance tasks should be co-ordinated with other sector activities to ensure that cleared land is put back to use.

It does no good to clear land that also requires other inputs such as seeds and tools, building materials or power poles if such items are not available. Limited clearance resources could be better employed until such time as all inputs are on hand. To do this requires close co-ordination between agencies, an open sharing of data, and a change of culture regarding the value of information.

6. Establishment of a "clearing house" for map and imagery products, as well as a standard set of formats for sharing data, would be a resource valuable across sectors and could lead to major improvements in synchronisation and co-ordination of relief/ rehabilitative activities.

The optimum allocation of mine action resources and greatest socio-economic benefits from mine action will only occur when such activities are integrated with and maximise the inputs provided by other rehabilitative activities. Such co-ordination is only possible when there is some standard "medium" for communication of needs, objectives and analysis. GIS technology, if applied correctly and appropriately supported by a major institution such as the European Union, the United Nations, or the World Bank, could form this medium. Ensuring that all agencies in any country are working from the same map sets, data transfer standards, and imagery is a vital first step.

Appendix 2

Case study of the Lao People's Democratic Republic

Background on the Lao People's Democratic Republic

Bordered by Thailand, Myanmar, China, Vietnam and Cambodia, the Lao People's Democratic Republic (Lao PDR) is a landlocked country, 236,800 square kilometres in size (slightly larger than Great Britain), and sparsely populated (5 million inhabitants, or 21 per square kilometre). Most people reside in the Mekong River floodplain in the west. Its eastern border with Vietnam is dominated by the Annam mountain chain through which crossed the road network known as the Ho Chi Minh Trail, made famous during the Vietnam conflict as the route taken by North Vietnamese troops into South Vietnam, and the site of saturation bombing by the United States of America (US).

Lao PDR is classified as one of the least developed countries, with an average Gross Domestic Product (GDP) of about US$280 in 1999.[1] In 1993, 46 per cent of the population fell below the national poverty line, even though Lao PDR is reasonably egalitarian.[2] In regional terms, the remote north and south-eastern parts of the country are poorest, in part because infrastructure and public services are even more rudimentary than elsewhere. In 1997 Lao PDR received US$71 per capita in official development assistance, equivalent to 19.5 per cent of GNP.[3]

Public expenditure of social services is extremely modest: 1.3 per cent of GNP on public health and 1.9 per cent of GNP on public education in 1996. This, coupled with the country's low-income level, is reflected in key social statistics. The average life expectancy is a mere 51 years. Infant mortality stood at 98 per 1,000 live births in 1997, while maternal mortality averaged 660 per 100,000 live births from 1990-97. Only 51 per cent of people have access to safe drinking water. Net enrolment rates in 1996 were only 18 per cent for secondary school and 72 per cent at the primary level, with many students dropping out before they attain even basic literacy or numeracy.

[1] In Purchasing Power Parity (PPP) terms it was about US$1,725.
[2] In 1992 its Gini index (a measure of inequality) was 30.4 — about the same as Canada's.
[3] In addition, remittances from abroad amount to 11 per cent of average household income (Government of Lao PDR, 1999c).

Key social and economic features[4]

Poverty and the rice economy

Lao PDR is an extremely poor country. Malnutrition is prevalent, with 10 per cent of the population acutely, and 47 per cent chronically, malnourished. The vast majority of Lao households (88 per cent) engage in agriculture, and fully 77 per cent of all households grow rice (Government of Lao PDR, 2000:2) far and away the most important crop and food source.[5] With an average per capita consumption of 582 grams per day, rice accounts for 25 per cent of household consumption by value, and almost half of all food consumption (Government of Lao PDR, 1999a:3-4, 13).[6] Lao PDR truly has a "rice economy".

Land tenure and holdings

Almost 97 per cent of agricultural lands are under "owner-like" tenure, giving most households secure access to land (Government of Lao PDR, 2000:4). Land distribution is reasonably equitable, but the average size of land holding is only 1.62 hectares, including fallow and non-agricultural land (*ibid*.:3). Only a quarter of farmers use chemical fertiliser or improved seeds, and only 20 per cent of land is irrigated, which means yields per hectare are low (for rice, averaging 2.9 tons per hectare in 1998). Many agricultural holdings are therefore too small to support the average household of 6.5 persons or 5 "consumption units".[7] Almost half of all Lao households cite lack of land or water control (irrigation for second cropping plus protection from drought and flooding) as the main obstacles to earning higher incomes.[8] Accordingly, Lao farmers spend about half their working hours on non-agricultural pursuits (hunting/fishing, part-time employment, handicraft) to supplement incomes and consumption (Government of Lao PDR, 1999b:24).

Ethnicity

Lao PDR is an ethnically diverse society, with the government recognizing 65 distinct ethnic groups. Roughly 60 per cent are ethnic Lao: either Lau Loum (lowland Lao) or Lao Thai, who retain more traditional culture. Some 34 per cent — mainly in the north — are Lao Theung (upland Lao), who practise swidden (slash-and-burn) agriculture and hunting. The remainder are Lao Sung (high Lao) hill tribes, the largest of which are the Hmong, some of whom were trained by the Central Intelligence Agency during the Vietnam War. There are also significant numbers of ethnic Chinese and Vietnamese.

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[4] This section uses statistics from a variety of sources, including: Government of Lao PDR, 2000; Government of Lao PDR (1999b); Government of Lao PDR (1999a and 1999b); and WFP (1999).

[5] In Lao, the same word is used for "food" as for "rice".

[6] Lao households produce much of what they consume — 94 per cent of agricultural households produce mainly for their own consumption (Government of Lao PDR, 2000:3) Therefore expenditure data — capturing only what is purchased - do not give a clear picture of well-being. The Lao expenditure and consumption survey therefore uses the concept of consumption, valuing household production for own consumption in the same way as if this had been purchased (Government of Lao PDR, 1999a:4)

[7] Household numbers are converted to consumption units thus: First adult=1, other adults=0.9, children 7-15=0.7, children under 7=0.4. This reflects that members share some expenses and that children need less food than adults (Government of Lao PDR, 1999a: 40).

[8] Only 3 per cent cited a shortage of jobs as their main obstacle (Government of Lao PDR, 1999a:36, Table 32).

Tensions do exist among the various ethnic groups.[9]

Politics and decentralisation

The Pathet Lao (Land of Laos) resistance organisation was formed in 1950 to fight the French colonial government. Following full independence in 1954, it formed the Lao People's Revolutionary Party (LPRP) as its political arm, which briefly entered a coalition government prior to a military coup in 1959. Armed struggle between the Pathet Lao — based principally in the north-east bordering North Vietnam —and the government continued throughout the period of the Vietnam War, until in late-1975 the Pathet Lao assumed power and declared the Lao People's Democratic Republic. Following a period of harsh "accelerated socialism" when many thousands were imprisoned or sent to re-education camps, a series of economic and political reforms started in 1979. The present constitution, passed in 1991, drew a distinction between the LPRP and the government, and strengthened the role of the National Assembly. However, almost all government members and senior public servants are members of the LPRP. The military remains influential within the party and, through its Bolisat Phatthana Khet Phoudoi Import-Export Company, is active in the economy.

Central control over the provinces has traditionally been weak, owing in part to poor transportation and communications links. Provincial administrations had almost complete fiscal autonomy until a 1991 decree that all public revenues must be collected by the national government and that provincial expenditures would be specified in the national budget. Recent economic reforms may be working against centralisation. The economic gap between the capital, Vientiane, and the provinces has grown because most foreign investment has gone to the capital and, as international trade increases, regions are becoming more integrated with China (north), Thailand (centre and south), or Vietnam (north-east and west).

Lao PDR is not a signatory to the Convention on the Prohibition of Anti-Personnel Mines (otherwise known as the Ottawa Treaty), although the Ministry of Foreign Affairs is co-ordinating a review of this position.

Development priorities

Economic reform

Initially the LPRP government introduced a centrally-planned economy, including agricultural collectivisation, which was strongly opposed and resulted in stagnation of the key agricultural sector. Tentative reforms were introduced in 1979, followed by a shift to a market-oriented economy in late 1986 with the introduction of the New Economic Mechanism. This featured a phased abandonment of collectivisation, coupled with privatisation, fiscal and monetary reform, and liberalisation of both trade and foreign investment. In July 1997 Lao PDR joined the Association of South-East Asian Nations (ASEAN) and the ASEAN Free Trade Area, suggesting that further strengthening of international links — both political and economic — is anticipated. From the start of economic reform until the 1998 Asian financial crisis, economic growth

[9] Many Hmong emigrated to the US following the 1975 takeover by the Pathet Lao. There are about 50,000 Hmong in the US, with perhaps 200,000 in Lao PDR.

was strong (averaging 7 per cent from 1992-97) but volatile, due mainly to periodic droughts affecting the dominant rice sector.

The impact of the Asian crisis

Growth in 1998 fell to 4 per cent, but this was buoyed by the huge subsistence agricultural sector, which, lying outside the market economy, is only indirectly affected by financial crisis. Annual inflation accelerated markedly to about 100 per cent in 1998, and may have reached 140 per cent in 1999. The fiscal deficit widened, forcing the government to cut its investment programme. Lao PDR has failed to rebound from the crisis as quickly as its neighbours, and both economic growth and government finances remain weak. Because of difficulties raising tax revenues, the government has resorted to financing some investment projects "off budget" by granting timber concessions to parastatals. These are expected to provide US$30 million for public investment projects in 1999-2000 — equivalent to almost 60 per cent of total domestic financing for public investment and nearly 20 per cent of government revenue from other sources.

Current development priorities

In 1996 the National Assembly set eight priorities for development:

- Infrastructure development,
- Rural development,
- Increase of food production,
- Promotion of production of commodities,
- Reduction of slash and burn agricultural practices,
- Human resource development,
- Promotion of foreign economic relations,
- Development of services.

In practice, public investment expenditure has concentrated on economic infrastructure — particularly road construction —, which has absorbed perhaps half of all public investment in recent years. This directly addresses the government's first development priority, but is also critical for rural development and to increase food production by allowing farmers better access to markets for their production and agricultural input requirements (seeds, fertiliser, etc.), and to the "incentive goods" needed to attract subsistence farmers into the market economy.

The government recently launched two major new investment programmes to promote rural development and food production, and to reduce environmentally destructive slash-and-burn agriculture. One is an expanded irrigation programme, for which it has purchased thousands of pumps from neighbouring countries and India. Second is a new rural development strategy based on larger "focal centres", where it plans to supply health clinics, schools, transportation, electricity and other public services in sufficient quantity to attract voluntary resettlement by households now practising slash-and-burn agriculture in communities too small and remote to warrant such public services. Both programmes have attracted controversy. In the past, public-sponsored irrigation schemes have suffered from lack of maintenance by government or water users.[10] Resettlement programmes are viewed with suspicion by donors and some

[10] The importation of thousands of pumps also depleted scarce foreign exchange reserves.

ethnic groups because of earlier forced resettlement measures, thought to be motivated by politics or the desire for access to timber concessions in addition to the official concern over environmentally-harmful agricultural practices.

Future prospects

The government has set an overall goal of graduating from the ranks of the least-developed countries by 2020, and expects most growth to come from the market economy. This could increase inequality. Accordingly, the new five-year development plan for 2001-2006 is expected to focus significant public investment on poverty reduction, including rural infrastructure investments to expand the reach of the market economy and allow provision of basic public services beyond the Mekong corridor.

To grow fast enough to achieve this target within a generation, Lao PDR must attract significant foreign finance from official and private sources. This in turn depends on restoration of macro-economic stability. While the manufacturing and services sectors can be expected to grow fastest, the vast majority of Lao PDR will continue to depend on agriculture for the foreseeable future. Performance of the rice economy is therefore critical for both food security and raising rural incomes sufficiently so farmers can buy manufactured goods produced in the cities. Increased agricultural income is also necessary to slow rural-urban migration, which could overwhelm the growth capacity of the urban areas. Rural households therefore need access to more land or to improved inputs (irrigation, fertiliser, high-yielding seeds, tractors, credit)—or both—to increase their production and incomes.

For the coming decade, the government foresees a "dual" agricultural economy (Government of Lao PDR, 1999b). Farmers in the east-central part of the country, better served by roads and with access to urban markets and Thailand, will increasingly enter the market economy. They will use modern inputs to increase productivity per hectare, then sell to the urban markets. Farmers in more remote regions, lacking ready access to markets or modern inputs, will continue low-yield subsistence agricultural practices. For them, enhanced well-being will chiefly depend on having access to sufficient land to feed the household.

History of mine and unexploded ordnance contamination

The independence war for Lao PDR began during the French colonial era, continued against the Japanese during the Second World War and, subsequently, against the French when they attempted to re-establish control over Indochina. Following the defeat of the French in 1954, fighting continued between the Pathet Lao, based in the north-eastern provinces of Phongsali and Houaphan, and the US-backed Royal Lao government. The principal contested provinces—Luang Phrabang bordering Phongsali, and Xieng Khouang bordering Houaphan—are heavily contaminated by UXO and, in some areas, landmines.

Lao PDR was also drawn into the wider Indochina conflict between the US and North Vietnam. The US had heavily fortified the "demilitarized zone" dividing North and South Vietnam, so the North Vietnamese Army developed a network of paths and

roads through eastern and southern Lao PDR,[11] allowing troops and supplies to skirt the demilitarized zone. Starting in 1964, the US responded by saturation bombing of this supply route, which it called the Ho Chi Minh Trail. This bombing, which continued until 1973, was the most intense in history, reaching 900 sorties per day and averaging the equivalent of one mission every eight minutes for nine years.[12] Over two million tons of ordnance was dropped on Lao PDR — equal to the combined total dropped by all combatants during the Second World War. Some 10-30 per cent of this ordnance, including millions of bomblets or "bombies" from cluster bombs, did not explode. In addition, the North Vietnamese Army established munitions depots along the Ho Chi Minh Trail, some of which were partially detonated by air strikes.

US and South Vietnamese troops also invaded eastern Lao PDR to block the Trail. The largest battle (called Lam Seun 719, in Savannakhet) reportedly involved 60,000 South Vietnamese against 100,000 North Vietnamese Army troops, and lasted 42 days before the South Vietnamese withdrew. Significant land battles also took place between Pathet Lao and Royal Lao forces in the Southern provinces of Champassak and Attapeu.

In addition to bombs, the US also dropped massive quantities of defoliants and herbicides, including Agent Orange. Studies have confirmed that the use of these chemicals resulted in significant dioxin contamination in nearby western Vietnam, but a study for Lao PDR is only in the planning stages (Hatfield Consultants, 2000).

Impacts[13]

The civilian population

The civilian population, and particularly those living in the north-east, east, central, and south-east regions, was profoundly affected by the prolonged conflict. In addition to those killed, thousands abandoned their villages and farms in the war zones — some to live in caves for protection. Combatants also resettled communities by force.

Following the Pathet Lao victory in 1975, hundreds of thousands of Lao who were affiliated with the Royal Lao government or directly with the US fled the country for refugee camps in Thailand or permanent residency abroad, mainly in the US. However, most of those internally displaced by the war returned to re-establish their farms and communities, and encountered massive UXO contamination. There is no clear documentation concerning casualties and adaptive measures taken during this initial period of spontaneous resettlement. It was not until June 1996 — 21 years after hostilities ended — that HI undertook a broad survey of the impact of UXO contamination on behalf of UXO LAO, the government agency established to co-ordinate mine and UXO programmes. In brief, the survey's findings were:

- Over 2,800 villages, or 25 per cent of all communities in 15 of the 18 provinces/ special zones in Lao PDR, reported the continued presence of UXO, while 214 villages reported landmines;
- Almost 1,325 villages reported UXO in the village or along roads or paths to fields or other communities;

[11] From north to south, the Trail ran through Bolikhamsai, Khammuane, Savannakhet, Saravane, Sekong, and Attapeu provinces.
[12] The US flew 580,344 bombing missions over Lao PDR between 1964 and 1973.
[13] This section draws on HI (1997a).

- Almost 12,000 UXO-related accidents were reported, with accident rates peaking at about 1,400/year in 1974 as people returned to their homes and fields. Casualty rates fell to an average of 360 per year from 1977-1986, then 240 per year for the following decade;
- Slightly more than half the victims died, with most others suffering amputation (31 per cent), paralysis (6 per cent), or blindness (4 per cent);
- 31 per cent of all victims were children (mostly boys);
- Almost one third of accidents occurred within the village, with a similar number occurring in rice fields;
- A significant, but falling, percentage of accidents arose when men were purposely handling UXO, often attempting to dismantle them for scrap metal (for sale to Vietnamese metal traders) or explosives (for use in fishing or clearing stumps);
- Accidents peak at the end of the dry season (March-May) when farmers are ploughing lowland rice fields or, in upland areas, clearing new fields by slash-and-burn.[14]

The overall picture is a familiar one, with a high rate of casualties during the initial return to villages abandoned during the conflict, followed by a slow decline in accidents as those in affected communities adapt to the contamination. Risk-taking behaviour, as extremely poor people attempt to capitalise on the UXO "resource", also resulted in many casualties in the early years of contamination. A significant number of villages have had to relocate due to mine contamination.

Community adaptations to UXO contamination involve difficult choices between curtailing economic or social activities and risking death or injury from UXO. In Lao PDR, many households could mobilise sufficient labour to expand their rice fields, but choose not to do so because clearing new land is too dangerous. Swidden farmers also reduce the land used because of fear of contamination. This implies a change in cropping patterns, returning to use lands after, say, five years fallow rather than ten, and thus reduced yields as the land would not have regained full fertility. In Lao PDR, such adaptations would mean that some households would accept seasonal or chronic malnutrition as the cost of reducing risks associated with UXO.

Those in affected communities would still experience heightened insecurity. Building a cooking fire while working rice fields could cause buried UXO to explode. Accidents still take place while hunting, fishing, herding livestock, or simply visiting the neighbouring community. More than 100 UXO accidents are still reported to authorities each year, implying a continuing rate of perhaps 200 accidents a year because many remote communities do not report.

Environmental impact

The most obvious environmental issue relates to the reduction in land used by swidden farming households in contaminated areas. This could either reduce or increase the environmental harm caused by extensive slash-and-burn practices. The total area exploited by slash-and-burn would be reduced, but the land used would be subject to more intense exploitation. Whether more or less harm is done would depend on the

[14] More accidents have been reported in upland farms than in the lowland areas. Upland farmers burn their fields before planting, sometimes causing ordnance to explode from the fire.

micro-climatic, soil, and vegetation conditions, and whether land constraints cause swidden farmers to convert more quickly to permanent cultivation.

Recent studies in Western Vietnam have found high levels of dioxin—a potent carcinogen—in areas sprayed with Agent Orange during the Vietnam War (Hatfield Consultants, 2000). There have been unusually high rates of birth defects and "wasting" diseases in the affected communities, and epidemiological studies are trying to confirm whether these are the result of dioxin contamination. The researchers have also found high levels of dioxin in the food chain; particularly duck liver and fish raised by aquaculture. Agent Orange was also sprayed extensively in parts of eastern Lao PDR, but similar studies have not yet started.

Explosives from "harvested" UXO are used for fishing, causing significant damage.

Public investments/Development projects

Many rural development projects have been adversely affected by UXO contamination, including those supported by international NGOs. Problems with UXO led to the initial humanitarian demining programme in Lao PDR, established in Xieng Khouang in 1994 by the Mennonite Central Committee and MAG. Action contre la Faim has reported numerous problems with UXO in the villages it works with in Sekong and Champassak. Oxfam has reportedly paid for villages to hire bulldozers from commercial firms to "clear" new fields for cultivation in Saravane.

The major aid agencies are aware of the UXO contamination and, in general terms, recognise it as a broad development problem.[15] Some larger aid-financed infrastructure projects (road and bridge construction, dams for hydro-electricity) have been affected by UXO contamination. In some cases, explicit provision for UXO/mine clearance has been made during the planning phase of the project, while in others UXO was discovered only during the construction phase. The study team did not hear any cases in which donor-financed projects were cancelled because UXO contamination would increase costs enough to make the project non-viable.[16] However, some government-financed projects have, reportedly, been cancelled or delayed due to high costs of UXO clearance.

Broader impact

There has been very little mention of UXO as a general problem in official development planning or strategy documents. There is no mention in the current five-year development plan, adopted in 1996. The *1999-2000 Socio-Economic Plan*, approved in October 1999, has but one sentence (on the need to train UXO personnel) in 34 pages of text. Given the scale of UXO contamination, this omission seems curious.

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[15] The World Bank has noted that UXO contamination adversely affects all rural development projects in at least two ways. First, it means that potentially rich agricultural land is unexploited, reducing rural prosperity and, thereby, the potential benefits accruing from rural development projects such as irrigation schemes and feeder roads. Second, UXO clearance and destruction raises the costs of rural infrastructure projects (World Bank, 1997:8). The Bank has not, however, attempted to quantify these impacts in formal cost-benefit terms.

[16] However, budget provisions for UXO survey and clearance in some cases seemed low, with these costs allocated to "'local financing" (i.e., a Government of Lao PDR responsibility). This suggests the budgets for UXO clearance are based on rather cursory analysis.

History of mine action in Lao PDR

Immediate post-war period

During the war, the Lao army cleared roads destroyed by bombing to maintain vital transportation routes. Following the war, the army and Vietnamese advisers continued clearance of roads, plus schools, *wats* (temples), and sites for new public buildings, irrigation works, etc. They also cleared a small number of villages, mainly in the north. The Chinese army did clearance in support of a Chinese-funded road construction project and, in 1979-80, a Russian aid programme cleared some farmland in Xieng Khouang. The Lao army is still used for clearance on large aid projects, mainly bridge and road construction, when such clearance is to be financed by the government rather than the donor.

Commercial demining companies are also present in Lao PDR, working mainly for mineral exploration companies, refugee resettlement organisations, and donor-funded infrastructure projects (roads, hydro-electricity). Milsearch, from Australia, undertook its first contract in 1992, and has since worked on over 30 assignments across eight provinces.[17] GERBERA, a German company, also takes commercial assignments, as well as undertaking humanitarian demining on behalf of the German aid programme. Other demining companies have had contracts in Lao PDR, but do not maintain permanent offices in the country.

Humanitarian mine action

Initial phase (1994-97)

The Mennonite Central Committee first brought the UXO problem to international attention. It also initiated a community awareness programme and contacted MAG to assist with UXO activities in Xieng Khouang. MAG assumed responsibility for community awareness in May 1994 and began training Lao deminers. It initiated clearance work in October of that year.

Subsequent discussions among the government, UNDP, UNICEF, and MAG led to the establishment of the Lao PDR UXO Trust Fund in late 1995, followed in February 1996 by a decree[18] establishing the Trust Fund Steering Committee and the Lao National UXO Programme. UXO LAO is a national public institution with autonomous financial status within the Ministry of Labour and Social Welfare with responsibility for:

1. Co-ordination of UXO-related activities within the country, including the UXO work implemented by other agencies;
2. Preparation of annual work plans and reports;
3. Managing the Training Centre;
4. Setting national standards;
5. Assisting the Steering Committee in resource mobilization for the Trust Fund.

Its goals are to:

- Reduce the number of civilian UXO casualties; and

[17] In Lao PDR, Milsearch operates under a joint venture with the major army company.
[18] Prime Minister's Decree 49/M.

- Increase the amount of land available for food production and other development activities.

One of UXO LAO's initial actions was to issue a request for proposals for a nation-wide socio-economic survey to quantify the extent of mine/UXO contamination and to establish priorities for clearance. This contract was awarded to HI in May 1996, and undertaken in three phases: Preparatory (develop questionnaire, mobilize staff); Phase 1 (data collection at provincial and district levels); and Phase 2 (village-level survey). Handicap International engaged local staff used in the 1995 National Census and used the coding system developed for that census by the National Statistical Centre to identify provinces, districts and villages. In addition, UXO LAO commissioned the Science, Technology, and Environment Ministry to undertake mapping and entering digitised information on villages, roads, and rivers so the survey results could be plotted on maps. This combined effort provided Lao PDR with its first full GIS — an important by-product.

Given the significant decentralisation in Lao PDR, coupled with poor transportation and communication links, the initial work plan provided for the establishment of small co-ordination offices in each province affected by UXO. In 1996, offices were opened in Xieng Khouang, Houaphan, and Savannakhet.

In May 1996, the US and Lao PDR signed a memorandum of understanding for US training support and in-kind assistance (equipment, vehicles, and materials). At the same time, UXO LAO obtained a residential training facility from the Ministry of Agriculture, and minefield clearance courses began in July. Subsequently, courses were organised for community awareness, medics, and provincial co-ordinators, plus train-the-trainer programmes for a cadre of Lao trainers.

In August 1996 the Government of Lao PDR approved a UXO programme for Houaphan, to be implemented by GERBERA and funded by German bilateral assistance. Actual clearance operations began in November 1996.

UNICEF assumed the lead donor role with respect to community awareness. Drawing on the experience of Mennonite Central Committee and MAG, UNICEF and the new community awareness section within UXO LAO developed a strategy to establish a coherent national programme for UXO awareness. A community awareness Technical Working Group was established, and in late 1996 it approved a strategy that articulated a three-pronged approach:

- Community awareness teams under UXO LAO to visit affected communities;
- Liaison with the Ministry of Education to integrate community awareness messages into the school curriculum;
- Development of non-formal education programming, via mass media (principally radio), posters, etc.

Consortium (a consortium of three American NGOs) took the lead in working with the Ministry of Education to develop a UXO awareness curriculum for primary schools. This was tested in Xieng Khouang in 1996.[19] It also assisted with the production of posters to inform people of restrictions on the purchase, sale, and use of war material.

[19] The revised curriculum has since been adopted by the education authorities in four provinces.

Drawing on lessons learned by MAG in Xieng Khouang, UXO LAO split deminers into two types of units: roving teams (to destroy ordnance on the surface), and clearance teams (to detect and destroy sub-surface ordnance). Roving teams allow for rapid response to immediate dangers presented by UXO on the surface, including caches of UXO moved by villagers from their fields, paths, etc. Clearance teams provided some capacity for the far more time-consuming task of clearing land for agricultural or development purposes.

Expansion phase (1997-1999)

The socio-economic survey was completed and published in October 1997. Even before the final results were available, it was clear UXO contamination was so widespread that programmes would be needed in the majority of provinces.[20] UXO LAO pursued a strategy of enlisting implementation partners to establish provincial operations. This allowed for rapid expansion, and gave interested donors the option of contributing to UXO LAO via the Trust Fund administered by UNDP or providing direct funding to an international NGO or other donor-country organisation. Table 1 provides the complete list of provincial operations. In addition, a number of countries provided funding via the Trust Fund, some of which was earmarked for specific expenditures, or provided direct, in-kind assistance to UXO LAO.

Table 1 - Provincial Mine Action Operations

Province	Implementing Partner	Start-up	Initial funding
Xieng Khouang	Mines Advisory Group	Oct-94	UK, Sweden, CIDSE (direct)
Houaphan	GERBERA	Nov-96	Germany (direct)
Savannakhet	Handicap International	Apr-97 (Belgium)	Belgium (via Trust Fund)
Saravane	Mines Advisory Group	Jul-97	EU, UK (direct)
Champassak	Belgian military	Sep-97	Belgium (direct)
Sekong	Norwegian People's Aid	Oct-97	Norway (direct)
Attapeu	Norwegian People's Aid	Oct-97	Norway (direct)
Luang Prabang	GERBERA	Apr-98	Germany (direct)
Khammouane	World Vision (Australia)	Jan-99	Australia (via Trust Fund)

From 1995 to the end of 1999, an estimated US$34 million in UXO expenditures had been financed by donors, with the breakdowns as indicated in the following Chart 1.[21]

Clearly, most financing (71 per cent on average) has been channelled through the six implementing partners rather than the UXO LAO Trust Fund. Trust Fund expenditures as a percentage of the total peaked at 47 per cent in 1998 before falling back to about

[20] The Socio-Economic Survey recommended that UXO operations be established in nine of the 17 provinces, plus the Saysomboune "special zone", which is under direct administration of the national government because of ongoing military activity. UXO LAO has not set up in Saysomboune.

[21] The expenditure breakdowns are study team estimates based on data supplied by UXO LAO and some of the implementing partners. The analysis is complicated by incomplete reporting, because organisations have different financial years and expenditure classifications, and because most of the funding flows through more than one organisation before it is finally expended.

one-quarter the following year.[22] As well, an estimated 44 per cent of expenditures from the Trust Fund were earmarked for specific purposes. Therefore, over the 1995-99 period, about 83 per cent of total expenditures have been tied in some form—either channelled through an NGO or private company, or earmarked for specific purposes. The US has supplied about 28 per cent of the funds expended through 1999, followed by Germany (12 per cent), Norway (11 per cent), Denmark (10 per cent), and the EU (7 per cent). Except for about two-fifths of Norway's monies, all funding from the major five donors has been channelled through implementing partners or earmarked for specific purposes. Much of this money has been to purchase equipment or provide trainers for Lao deminers, community awareness personnel, medics, and supervisors.

Chart 1: Expenditures 1995-99 (estimates)

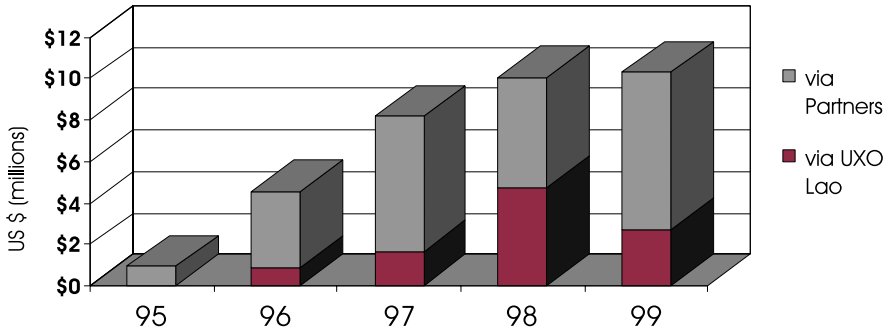
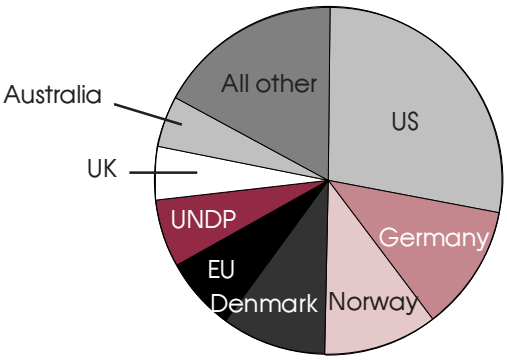


Chart 2: Source of Funds Expended 1995-99



Transition phase (1999-2002)

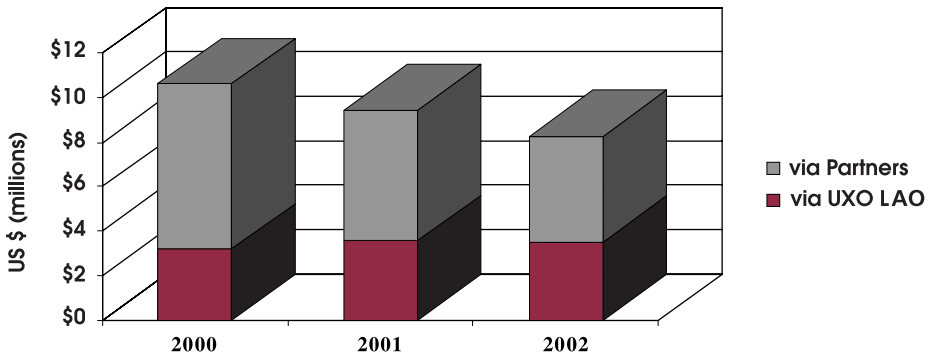
The first of the implementing partners (MAG and GERBERA) engaged local staff directly and were responsible for operations management in Xieng Khouang, Saravane, and Houaphan. Since mid-1997, new implementing partners have operated principally as advisors, responsible in the main for capacity building (including most equipment

[22] In 1998, more than US$1 million of the US $1.7 million in "core support" from UNDP to UXO LAO was expended.

acquisition). In such cases, Lao personnel were hired and trained by UXO LAO and then assigned to provincial operations.[23] From July 1999 to April 2000, UXO LAO began assuming direct responsibility for managing the Houaphan, Saravane and, finally, Xieng Khouang operations. Implementing partners retain their capacity-building roles, and are expected to phase out of the programme over time.

The Lao government is clearly concerned at the expansion of the programme and its capacity to maintain this scale of operations, should donors significantly reduce their assistance. Accordingly, it has decided to halt further expansion, and will maintain a staffing level of 1,100-1,200 personnel, of which approximately half (including section leaders) are deminers. Also, in mid-1999 the government required UXO LAO to reduce staff salaries by an average of 22 per cent.[24]

Chart 3: Planned Expenditures 200-02



Victim assistance[25]

The above figures do not include expenditures on victim assistance, as UXO LAO is not involved in this area.[26] The Ministry of Public Health (MoPH) is responsible for most aspects of victim assistance, including the National Rehabilitation Centre, which operates in Vientiane and in six provincial prosthetic and orthotic centres. The Ministry of Labour and Social Welfare (MLSW) includes the Department of War Veterans and Social Welfare, which has a central prosthetic centre north of Vientiane plus a number of "disabled villages" established for war veterans. There also is a Lao Disabled Peoples Association and a National Committee for Handicapped Persons, which serves principally as a communication link between the MoPH and MLSW. There is a good orthopaedic and trauma surgery hospital in Vientiane supported by French assistance.

[23] UXO LAO's policy is to engage staff from the districts in which it is operating, so long as the candidates have the minimum qualifications. A number of staff have close relatives who were killed or injured by UXO. A proportion are women, generally, but not invariably, assigned to the community awareness teams.
[24] Initially, salaries for deminers and community awareness personnel were based largely on the salaries established by MAG for its locally-engaged staff, which were significantly higher than comparable public service positions.
[25] This section is based on Landmines Survivors Network (1998) and an interview with Thomas Keolker of the Co-operative Orthotic and Prosthetic Enterprise (COPE).
[26] The decree establishing UXO LAO makes no mention of victim assistance.

A number of international NGOs have provided assistance for the disabled, including Handicap International (prosthetics, physiotherapy), World Vision (prosthetics), World Concern (community-based rehabilitation, including micro-credit), Consortium (financial assistance to UXO victims), DED from Germany (physiotherapy), and POWER (prosthetics). In 1998, POWER joined with other NGOs and relevant government agencies to form Co-operative Orthotic and Prosthetic Enterprise (COPE). It supports the National Rehabilitation Centre with technical assistance, equipment and training. The budget for the first phase (1998-2001) is approximately US$3.55 million, including US$866,000 (in-kind and funds) from the Lao government.

A mid-term evaluation of COPE indicated most of its services have been taken up by men with below-the-knee amputations residing in the Vientiane region. Fewer services have reached women and children, and those in remote areas. The board of COPE therefore decided recently to expand the scope of rehabilitation available in Lao PDR, adding occupational therapy, orthopaedic surgery, trauma therapy, and an athletics programme, coupled with an assistance tracking system and, generally, a more proactive approach. The budget for this programme is about US$5.5 million to March 2004, after which time expatriate assistance to COPE will phase out.[27]

The MLSW operates about 60 vocational training centres, but few of these have ever taken disabled trainees. An order of nuns from Thailand hopes to establish a vocational training centre for the disabled, and COPE plans to hire an officer to co-ordinate with other vocational centres to better serve the disabled.

Very little of the available assistance is earmarked for UXO victims; rather, it supports services and facilities for disabled people in general.

Approaches to setting priorities for humanitarian demining

Initial phase (1994-97)

Initially, those engaged in humanitarian demining gave clear priority to risk reduction, with broader socio-economic considerations secondary. MAG started work in 1994 with a community awareness programme. When it began clearance activities the following year, it developed a strong focus on "roving clearance" to destroy UXO on the surface and thus reduce this obvious accident risk. HI's *Socio-Economic Survey* also reflected this focus on risk-reduction. This survey captured three main types of community information—history, accidents, level and location of contamination—and ranked communities as follows:

Table 2 - Socio-economic survey ranking of affected communities

Level of contamination	Characteristics
Severe	Recent accident reported
High	UXO in central village or major routes/paths
Moderate	UXO in primary agricultural fields
Low	UXO in grazing land

[27] A number of Lao are receiving training abroad, and will return in 2003.

Originally, attempts were made to develop a single quantitative score for each village by statistical means, but subsequently this was abandoned as each community's classification was, effectively, determined by a single datum (i.e., an accident reported or, where there was no accident, the location of the UXO). Analysis revealed that 40 per cent of reported accidents occurred within villages or along main thoroughfares, and the location of UXO was a good indicator of accident risk, so the "severe" category was dropped. The current classification is based entirely on the reported location of UXO. Districts[28] were then categorised using the same simple schema, based on the numbers of UXO affected communities and their rankings. Finally, a provincial priority ranking was established.

In establishing UXO programmes, agreements with implementing partners were made by province. Each partner, together with UXO LAO, would then establish a provincial headquarters with more-or-less distinct operating units in the most severely affected districts. Thus, the district became the principal unit for work planning by provincial operations. However, the decision-order was, first province, then district, and last, task assignments to villages.

The following table and analysis gives some indication of how closely the timing and sizes of the various provincial operations correspond to the *Socio-Economic Survey*'s priority rankings.

Table 3 - Correlation of provincial mine action operations with socio-economic survey ranking

Province	Priority rankings by:		
	Socio-economic survey	Order of start dates	Size of operations[a]
Savannakhet	1	3	2
Xieng Khouang	2	1	1
Saravane	3	4	3
Khammouane	4	9	9
Sekong	5	6	5
Champassak	6	5	8
Houaphan	7	2	4
Attapeu	8	7	7
Luang Prabang	9	8	5
Correlation with survey ranking		.50	.52

[a] Measured by number of Lao staff as of April 2000.

This indicates that the start-up order and current sizes of provincial operations correlate only moderately with the priority rankings set in the survey, and suggests difficulties in negotiating provincial agreements with multiple donors and implementing partners.

Once provincial and district operations were established, roving clearance teams were assigned primarily to highly contaminated communities to remove UXO from village centres and major paths. This approach served to reduce risks and would bring significant benefit to social infrastructure (i.e., schools, clinics, *wats*, wells, etc. in

[28] Districts are sub-provincial administrative units, headed by a district governor. There are 142 districts.

villages) and to some aspects of economic activity — mainly small-scale commerce such as village markets and marketing between communities, and to kitchen gardening. However, it offered little direct benefit to economic production, which for most communities is based on rice production.

Integration of priority-setting and work planning (1998 to date)

Given the highly decentralised nature of Lao public administration, and the desire to maintain overall coherence for a programme implemented in conjunction with six international partners, UXO LAO headquarters devised a standard system of annual work planning for all provincial operations, starting in mid-1998. The work planning system has the following features:

1. All activities must correspond to the agreed priorities for UXO LAO and the Trust Fund, namely:
   "… programmes shall be carried out for peaceful purposes only and according to the following order of priority:
   a. Humanitarian purposes;
   b. Economic purposes, for the expansion for agriculture and rehabilitation, reconstruction or development projects;"

Further:

"The Lao PDR Trust Fund may not be used to subsidise the cost of UXO clearance for commercial projects . . . However, UXO LAO may provide services to private natural or corporate persons or institutions and charge for the service. The charges shall not exceed the production costs."[29] (UXO LAO, undated).

For clearance activities, the priorities enunciated for 2000 (UXO LAO, 2000) are:

"Roving clearance:
- *Emergency requests — where ongoing work is halted or daily life is affected due to the presence of UXO.*
- *Areas where people have already found and marked ordnance.*
- *Ordnance on the surface in the village or agricultural land.*

Area clearance:
- *Land to be cleared for agriculture in high-risk areas, affecting large numbers of people in the poorest villages.*
- *Contaminated land where a community structure such as a school, market, or clinic will be built.*
- *Land where funded development projects are being delayed by the presence of UXO."*

2. Provincial Steering Committees (SC), chaired typically by the vice-governor, have been established, with representatives from key ministries, the UXO LAO provincial co-ordinator, and from all districts in which UXO LAO is operating.

3. Proposals for community awareness, roving, and clearance are solicited by the SC and UXO LAO from each of the districts. These are vetted by the SC for adherence with national priorities and combined with the provincial administration's own priority task list. A detailed work plan is then prepared

[29] UXO LAO has just commissioned a study to examine the feasibility of "reimbursable demining".

showing where each community awareness, roving, and clearance team will be working for each week in the coming year. As there never are enough resources to complete all tasks put forward by the district and provincial authorities, cuts to the task list are made through an iterative process.

4. The draft work plan is then signed-off by the governor, the UXO LAO provincial co-ordinator, and (regarding technical feasibility) a representative from the implementing partner.

5. The signed work plan is then submitted to UXO LAO national headquarters where it is vetted and approved by the national SC.

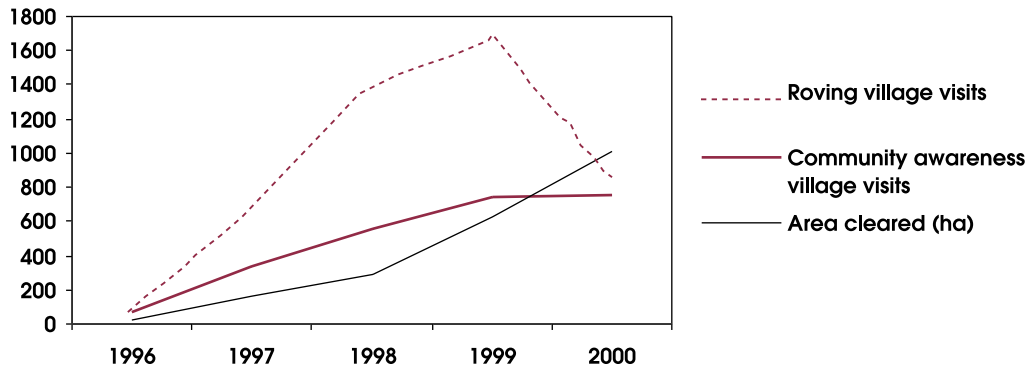
6. During the course of plan period, provincial and district personnel have the flexibility to make minor adjustments to the schedule of community awarenss and roving teams based on emerging priorities, weather conditions, etc. They also are allowed to alter the schedule of UXO clearance activities without prior approval from national headquarters. However, they are not allowed to add or delete a UXO clearance task from the task list without prior approval from the national level.

Clearly, this process is designed to establish good annual work plans ***and*** to do so in a very transparent manner. The focus of attention is on clearance activities, which are very expensive in terms of equipment and labour, and which also provide significant economic benefit to agencies or individuals whose land is cleared. This is where strong incentives exist to substitute private interests for national priorities.

The work planning process also represents a useful integration of "top-down" and "bottom-up" planning. District authorities are asked to submit their lists of tasks, which must adhere to national and provincial priorities.[30] Requests from districts strongly reflect economic priorities. Clearance of land for expanding rice paddies and irrigation works are most common, followed by clearance for "development projects" (public works, village potable water systems, resettlement schemes, etc.).

The following chart clearly indicates the apparent evolution in priorities. Community awareness and roving clearance team visits to villages are levelling off, while demand

Chart 4: Growth in UXO LAO Activities



[30] The latter generally are framed as development priorities; typically a sub-set of the eight national development priorities, listed earlier.

for clearance is increasing. In part this is due to the fact that most of the highly contaminated villages have now been visited by community awareness and roving teams, while the clearance task remains immense. While district authorities clearly are happy that community awareness and roving work are under way, all districts want more clearance teams to address land shortages and other economic constraints.

The annual work plan is important as well because it represents the principal accountability framework extant.[31] To this point in time, UXO LAO has not established a national quality assurance system for field operations or training, and does not have an internal audit unit. It is now completing a manual of standard operating procedures to apply across all provincial operations, which will form a clear basis for management and quality assurance audits.

Only two annual cycles of work planning have been completed. A good start has been made but, understandably, there remains room for improvement. For example, the resulting work plans remain only marginally useful for performance monitoring as the annual targets (hectares of land cleared, amount of ordnance destroyed, etc.) agreed to date have invariably been set low, and are easily attained. As well, UXO LAO headquarters does not have the capacity to provide adequate logistical support (including equipment repairs) to the provincial operations,[32] which results in excessive downtime for operational teams and makes it difficult to determine who should be held responsible when there is poor productivity. UXO LAO recently commissioned a study of its logistics operations and hopes to receive assistance from AusAID to implement the recommendations.

Importantly, UXO LAO headquarters is continuing its efforts to enhance its database to provide more "intelligence" for field operations. It updates village records based on monthly or assignment completion reports from the roving, community awareness, and clearance teams, and compiles a range of useful monthly reports tracking operations and progress achieved. It has obtained detailed records on US air combat activities, giving capacity to forecast which areas are likely to be contaminated.[33] It also is seeking to obtain community-level data from recent population and agricultural censuses, which will vastly increase the scope and accuracy of demographic and economic data available for work planning and priority setting.[34]

Other clearance

In addition to UXO LAO, at least two commercial firms (Milsearch and GERBERA) and the Lao army remain active in mine/UXO clearance, for a variety of clients – provincial authorities, private developers, mineral exploration firms, civil engineers working on hydro-electric projects, and aid contractors building roads, bridges and airports. The latter aid projects are too large for UXO LAO to consider. Often donor

[31] Common reporting formats, made possible by standardised work plans, were established in January 1999.

[32] This difficult task has been further complicated because most equipment has been procured through tied-aid arrangements. Thus, there are too many different makes and models of equipment, which complicates training of mechanics and stores operations. Also, much of the equipment is unsuitable for Lao PDR.

[33] Like IMSMA, UXO LAO's database contains records on communities (treated as "points" in a GIS system) rather than minefields, battle sites, etc. (all treated as "areas").

[34] This is feasible because UXO LAO has worked closely with the National Statistical Centre and other government and donor agencies, and a standard GIS system has evolved.

agencies will require the Lao government to assign the army for the expensive job of clearance for road and bridge projects, but the donor or their prime contractor will then hire a firm like Milsearch to do the initial surveys and provide quality assurance and insurance coverage.[35]

While the study team could obtain only indicative data on current commercial and military clearance activities, our impression is that UXO LAO represents perhaps half the overall clearance capacity in the country.

Costs of mine action[36]

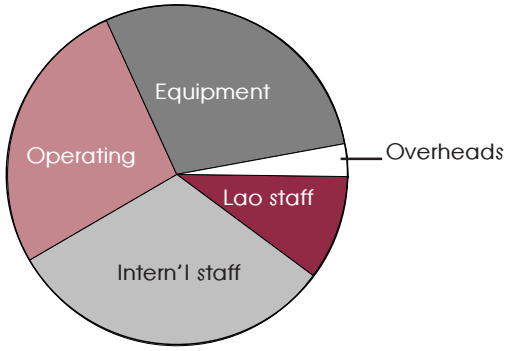
UXO LAO

Total costs

Annual expenditures have grown rapidly from perhaps US$1 million in 1995, and should peak at a budgeted US$10.6 million this year. Expenditures are expected to fall to US$8.3 million by 2002, by which time the reliance on international advisors will reduce and the budget will likely be around US$6 million.[37]

Such an expenditure pattern—quickly rising as operations get established and "capacity-building" takes place, then declining as international personnel are withdrawn—is typical when developing new capacity in a developing country. It does, however, create problems for cost analysis. For example, if we want to know how much, on average, it costs to clear a hectare of land, which costs should we consider? Including salaries of international personnel and "set-up" costs to conduct the socio-economic survey and to establish new facilities, management systems, and training programmes would give an inflated picture of costs that will prevail once UXO LAO staff can manage without continuing technical assistance. From the graph below, it is clear that such capacity building and start-up costs have been very significant.

Chart 5: Purpose of Expenditures 1995-99



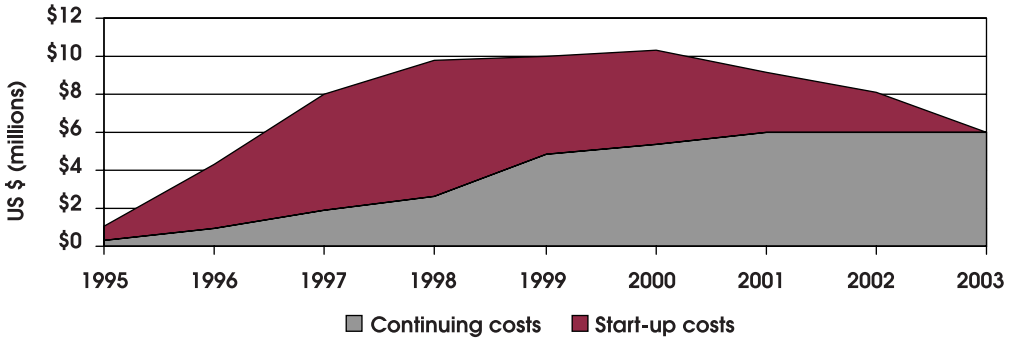
[35] Commercial firms generally carry specialised — and hard to obtain — demining insurance coverage to supplement site insurance carried by the prime contractors.
[36] While the study team received excellent co-operation from UXO LAO and implementing partners, we could not obtain a complete set of cost data. As well, various agencies report on different time periods, use different expenditure classifications, and value in-kind aid differently. The usual caveats therefore apply (see Hallam, 1996:13-15).
[37] At this level, expenditures should be approximately one-third personnel costs, one-third capital equipment (repair and replacement), and one-third all other operating costs. This assumes a stock of capital equipment averaging US$6 million, with an average economic life of three years.

Start-up and capacity-building

Salaries and benefits for international staff have constituted perhaps one-third of the estimated US$34 million in expenditures from 1995-99,[38] with another 30 per cent going to capital equipment (vehicles, mine detectors, computers, etc.). Salaries and benefits for Lao personnel have accounted for perhaps 10 per cent of total expenditures, while overhead payments to UNDP and the various implementing partners represent at least three per cent. The remainder (approximately one-quarter) covers various operating expenses: fuel, explosives, equipment maintenance, office rental, and so on.

The following graph is an attempt at separating "continuing costs" from various "start-up" costs for UXO LAO. Continuing costs (i.e., those required for UXO LAO to maintain its operations efficiently without continuing technical assistance) are estimated at US$6 million per annum from 2001, split equally between personnel costs, equipment replacement and repair, and other operating costs. Reasonable estimates of local salaries and benefits are available from the start of operations. Assuming an equal amount for both equipment and other operating costs for each year gives the continuing cost element for past years. All other recorded expenditures are assumed to be start-up costs of various types. The following picture emerges.

Chart 6: Cost Breakdown 1995-2003



While the assumptions used are far too heroic for this picture to be any more than suggestive, start-up costs clearly are very significant, and could represent half the total costs for 1995-2003, and 25 per cent of 2002 costs, after which international personnel are scheduled to withdraw.

The costs of tied aid

A proportion of the equipment purchased or provided under tied-aid arrangements has proven to be unsuitable. This has been particularly true of vehicles. Based on estimated equipment purchases of US$16.65 million, perhaps US$3 million (18 per cent) in equipment services were lost to UXO LAO and its implementing partners because of tied aid.[39] This figure could be far higher because the unsuitable equipment is often out of use awaiting repair, which limits the mobility or effectiveness of UXO LAO staff.

[38] This includes a rough estimate for US Special Forces military personnel who delivered training. However, no breakdown of the very significant training costs is available, so the estimate should be treated with caution.

[39] This estimate is based on a simulation model using UXO LAO records for vehicles and depreciation schedules. Basically, unsuitable vehicles depreciate more rapidly, have to be replaced more quickly, are more expensive to maintain, and are unavailable for longer periods because of more frequent breakdowns and waits for spare parts. In UXO LAO's case, preferred vehicles are no more expensive to purchase.

In addition, most of the training has been provided by the US Special Forces, following classic minefield clearance approaches.[40] Graduates assigned to the provinces have then been given additional training by implementing partners in battlefield clearance techniques, which are more appropriate for UXO clearance.

Unit costs

UXO LAO recently commissioned a "cost-capture study" to develop unit cost estimates (Fisher, 2000). This treated international staff costs and the administrative expenses of implementing partners as start-up costs, and arrived at the following estimates for 1999.

Table 4 - Selected Results of UXO LAO's Cost-Capture Study

Item	Unit cost estimate
One deminer or community awareness staff	US$6,800 per staff per year
Clearing 1 hectare of land	US$4,400 per hectare[a]
Cost per village - roving	US$500 per village
Risk reduction via community awareness	US$4 per beneficiary

[a] The study used a figure of 578.6 hectares cleared in 1999. Subsequent documents from UXO LAO report that 622 hectares were cleared, which would reduce the average cost to under US$4,100 per hectare.

The study found significant variation across provincial operations. For example, clearance costs per hectare ranged from under US$4,000 for provinces with long-established operations to more than US$20,000 for provinces in which clearance had only recently started. This suggests significant productivity increases during the initial years of operations. One would expect average costs to continue falling for some years because of "learning-by-doing". For land clearance, average costs should fall below US$3,000 per hectare well before 2002.[41]

Victim assistance

No estimates are available for victim assistance costs. The relevant programmes serve the disabled in general and expenditures on UXO victims are not reported separately.

Measuring benefits

Qualitative assessments

Until recently, few quantitative assessments were available concerning the benefits accruing from the work of UXO LAO and its implementing partners. The number of

[40] As well, early community awareness training was based on programmes developed in the US and not fully adapted to Lao conditions.

[41] Very roughly, plans for 2000 indicate a 75 per cent increase in hectares clearance compared to the figure used in the cost-capture report, while local costs will increase perhaps 10-15 per cent in total. This suggests an average cost per hectare in the range of US$3,000 in 2000. Meanwhile, private clearance firms operating in Lao PDR indicated costs in the range of US$2,200 per hectare (and up, depending on the local conditions) for UXO clearance.

accidents seems to have fallen from 240 per year (1987-96) to fewer than 200 per year today, but this figure is only a rough estimate based on incomplete reporting. The usual quantitative data are compiled (hectares cleared, ordnance destroyed, people briefed, etc.), but these alone give little information about economic or social impacts. As such, priorities have been set and assessments made based on qualitative indicators of likely benefits. Provincial and district work plans are assessed according to their adherence with national criteria coupled with local priorities and technical feasibility. The expressed satisfaction of provincial and district authorities gives UXO LAO headquarters a rough — albeit important — gauge of the benefits accruing from each provincial operation.

Economic assessment[42]

Cost-benefit analysis

While formal economic cost-benefit analysis of humanitarian programmes is fraught with controversy, Lao PDR offers an unusually good opportunity to employ this tool, for a number of reasons. Most fundamentally, sufficient time has passed since the war for the economy to have stabilised. Second, Lao PDR remains a simple economy, particularly in remote areas where most of UXO LAO's work takes place. For most Lao, rice remains central to both production and consumption. Third, reasonably good data are available.

The "cost-capture study" commissioned by UXO LAO included a discussion of how benefits accruing from UXO activities might be measured, and generated preliminary estimates for financial/economic benefits. Building largely on that work, the estimated present value of clearing one hectare of "wet season" rice land (our baseline scenario) is about US$3,540.[43] This means that an expenditure today of up to US$3,540 to clear a hectare of land would be justified on economic grounds alone. Given the average cost of clearing one hectare has been estimated at US$4,000-4,400 in 1999, and this can reasonably be projected to fall below US$3,000, future UXO clearance appears justified ***on economic grounds alone*** in Lao PDR.[44] The economic case is even stronger for clearance of irrigated rice land, agricultural land for higher-value export crops, and houses, markets and social infrastructure (schools, health clinics, etc.) in villages. Finally, the economic case will strengthen over time as agricultural productivity and rural prosperity grows in Lao PDR.

A number of critical caveats are necessary. First, the economic case for future clearance will depend significantly on the long-term productivity of UXO LAO personnel after the international advisors withdraw. If productivity falls significantly because of weak management and supervision, poor maintenance of equipment, or major cuts to non-wage operating costs without corresponding reductions in staffing levels, then unit costs will rise — perhaps past the point where costs outweigh benefits.

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[42] This section summarises some of the key findings derived in the chapter on socio-economic analysis.
[43] The remainder of this section focuses on UXO clearance. It is difficult to estimate economic benefits accruing from risk-reduction activities such as community awareness and roving clearance. As well, the results are ***always*** fraught with controversy. See Chapter 3: *Socio-Economic Analysis of Mine Action* on economic analysis for some discussion.
[44] We still can only state that clearance ***appears*** to be justified on economic rationale. A more definitive conclusion would require an assessment of other possible uses of the resources expended in UXO clearance. It may be that other development activities would provide even higher rates of return than UXO clearance.

Second, the cost estimates do not include start-up and capacity-building expenditures such as salaries and benefits for technical assistance personnel.[45] Such costs clearly are significant in the case of UXO LAO (as in most humanitarian demining programmes). The economic benefit accruing to such start-up costs must ultimately be based on the net economic benefit associated with continuing operations. Estimates of this type are very sensitive to the assumptions used, but if UXO LAO can continue to reduce unit costs through productivity increases, the programme should generate significant net economic benefits from about 2002, eventually justifying the high start-up costs.[46]

The standard economic case for clearance does not depend as significantly on who benefits – a ton of rice produced would net a wealthy person just as much as it would a poor person, so the monetary measure of the economic activity remains the same. However, a breakdown in the transparency of the annual work planning process, or in the oversight to confirm exactly which land has been cleared, could leave the door ajar for misuse of resources and jeopardise donor support to humanitarian clearance in Lao PDR and perhaps elsewhere.

General observations

Ultimately, the economic benefit of UXO clearance is derived from the economic benefit accruing to the underlying activity or project. For example, if an NGO potable water project promises significant social and economic benefits in terms of time saved, better health, etc., then modest expenditures on UXO clearance to enable its construction will be justified on economic grounds. If land is cleared for agricultural purposes but nothing is grown on it for a year or two,[47] the economic benefits are greatly reduced.[48] UXO clearance may make economic or other development activity possible, but it does not guarantee that the activity will take place as planned. As such, co-ordination with other agencies — and with the communities themselves — is important to increase the likelihood that benefits will accrue as planned.

More generally, the future economic benefits realised from any development activity depend significantly on the overall health of the country's economy. This in turn depends on government policies and expenditure patterns, the absence of natural calamities such as drought, and whether households have sufficient confidence to invest to improve agricultural productivity. For example, the baseline scenario for wet-season rice assumes productivity growth (measured in yield per hectare) of 2 per cent per annum.[49] If productivity does not grow because farmers do not make investments, the present value of future rice production falls by 7.8 per cent to just over US$3,000.

[45] For the baseline case, no adjustment has been made for the costs associated with tied-aid equipment purchases and training services. Such an adjustment would strengthen the economic case for UXO clearance, assuming such tied-aid practices will stop eventually.
[46] See the section on *Evaluating the Entire Clearance Programme* in Chapter 3.
[47] Such delays could occur for many reasons, including: the land is not allocated to a farm household; critical inputs (e.g., credit to buy bullocks, seed) are not available at the right time; the government does not complete planned resettlement in time; too much food aid is delivered, depressing local food prices and making it unattractive to plant rice.
[48] Using the example of wet season rice, delay of one year reduces the present value of benefits by over 10 per cent, to about US$3,155.
[49] This was the average for 1985-1997. In India during the Green Revolution, productivity in yield per hectare grew by 2.4 per cent per year for an extended period.

Cost-effectiveness analysis of risk-reduction measures[50]

Formal cost-benefit analysis is not particularly illuminating for assessing the benefits accruing from risk-reduction measures instituted in poor countries. It is difficult to place a financial value on human life, and many people find even the concept distasteful. Still, it is incumbent on all those entrusted with scarce aid resources to understand the relationship between costs and performance, even when the benefits of good performance cannot be reduced to monetary values. Cost-effectiveness analysis can be a useful tool in such situations. For example, one can compare the average cost of saving one life through a mine/UXO programme and compare this to the cost of saving one life through, say, malaria control or training programmes for traditional birth attendants. This does not require a monetary sum to be given for the value of a life; only an assumption that a life saved through malaria control is equally precious as a life saved through mine action.

Unfortunately, we have no accurate count of the number of lives saved and injuries avoided in Lao PDR due to UXO awareness activities, roving clearance, etc. However, even very rough calculations demonstrate that UXO/mine awareness and roving clearance are relatively expensive in terms of lives saved and injuries avoided relative to various other public health and safety programmes in Lao PDR. Deaths from UXO accidents seem to have averaged 240 per year in the decade before the *Socio-Economic Survey*, and may be averaging fewer than 200 per year since 1997. Assuming half the accidents are fatal, then there are 40-50 fewer deaths per year from UXO accidents, with a similar reduction in injuries. The cost-capture study estimated the costs of community awareness activities at about US$700,000 in 1999, with roving clearance accounting for another US$860,000. Even with the implausible assumption that all accident reduction has been due to community awarensss and roving, the cost per death/injury avoided is over US$15,000. Meanwhile, public expenditure on health amounts to only US$5 per year per person, and there are 1.4 million cases and 14,000 deaths each year from malaria, which can be combated through inexpensive insecticide-treated bed-nets.

Environment

Reduction of slash-and-burn agricultural practices is one of the government's eight development priorities. It aims at reducing ecological degradation caused by deforestation, particularly in the mountainous north and east where level land for paddy rice cultivation is at a premium. UXO clearance can assist by opening new land for rice paddies, and by clearance for irrigation to allow more intensive cultivation. As with economic benefits, environmental outcomes will depend of the timeliness and quality of other development services available to the households settling on the cleared land. If agricultural extension services and critical inputs (seeds, credit) are not provided, it is unlikely that swidden farmers will be able to make the transition to paddy rice cultivation, and they will return by necessity to their former practices.

Food security

More than half the Lao population suffer from episodic or chronic malnutrition. Access to sufficient land is one of the major constraints cited by Lao households to improved well-being, as is water control. Obviously, UXO clearance can alleviate some of this

[50] See Chapter 3 above and Hallam (1998) for further treatment of this topic.

poverty by making more land available and by clearing irrigation systems. Given many Lao live outside the monetary economy, direct calculations of food security benefits are a useful supplement to other forms of economic analysis. On average in Lao PDR today, one hectare of flatland paddy can meet the rice requirements of just over eight people.[51] UXO LAO will clear over 500 hectares of agricultural land this year, which in turn will provide sufficient food, year-after-year, for about 3,500 people.

Existing integration with development work

Local and micro levels

Through its work planning process, UXO LAO operations are becoming better integrated at the district and micro (community, NGO, etc.) levels. Increasingly, government agencies, NGOs, and managers of major aid projects are seeking assistance from UXO LAO. Recent examples include requests for clearance from:

- International NGOs such as Oxfam and Action contre la Faim for community development projects they are supporting;
- ACF for small scale gravity-feed potable water systems, which they are installing as sub-contractors on the large Bolovens Plateau Rural Development Project, financed by the French aid programme;
- The Mountainous Zone Development Project,[52] which is building the first large "focal site" for resettlement of up to 5,000 people (some threatened by a new hydro-electric dam; others to reduce slash-and-burn) at Pa-am in Attapeu Province.

At least the last of these requests comes close to encroaching on the unwritten understanding that UXO LAO would not assist large-scale development projects because of capacity constraints. Is there really a difference between assisting a government agency building a new town, with the requisite infrastructure, and assisting a donor-financed project constructing farm access roads on behalf of the government?

National and provincial levels

UXO LAO's work programme also ties in closely with a number of the national development priorities, as well as those in most provinces. However, there rarely is any mention of the UXO problem or of UXO LAO in macro-economic and national development documents.[53] This seems a curious omission given the scale of UXO contamination and the significant donor resources allocated to the problem.[54]

Two possible explanations come to mind. First, UXO contamination may not be perceived as a priority to government officials — after all, Lao PDR is extremely poor

[51] In countries receiving food aid, this figure can readily be converted into monetary terms by using the per person cost of purchasing, shipping, and distributing food aid.
[52] The MZDP is a new para-statal responsible for rural development in two mountainous districts of Attapeu. It is financed "off-budget" by a concession to cut 30,000m^3 of timber; expected to raise 40 billion kip (about US$5 million).
[53] While the study teams were unable to obtain provincial development plans, we understand that few of these mention UXO.
[54] Donor-financed expenditures by UXO LAO and its implementing partners represented about 6.5 per cent of total aid grants recorded by the government in 1997-98. There may be some under-reporting of grant aid by the government because of in-kind donations and funding through international NGOs.

and faces many economic and social hurdles. Second, the country has lived with UXO for 25 years without having the capacity to deal with the contamination. It may be recognised as a significant problem, but in a similar way as the weather, and one doesn't expect the government to change the weather. If the latter hypothesis is correct, we would expect greater attention to be given to ordnance contamination as the UXO programme gains experience and profile.

The latter hypothesis is plausible. The National Assembly passed the current national development in 1996; before many would be aware that UXO clearance on a significant scale might be feasible. UXO LAO's work planning process, which actively solicits priorities from district and community levels, has only been through two annual cycles. Indications are that demand for more and faster clearance is growing significantly. Senior officials from provincial administrations and the State Planning Committee informed the study team that they were aware of far greater demands for UXO clearance.[55] If so, we would expect greater mention of the UXO issue in future development plans published by the national and provincial governments.

Some evidence consistent with this hypothesis is available. The Lao Expenditure and Consumption Survey 1997/98 did include a question of whether mine/UXO contamination was the ***main*** constraint on raising household incomes (Government of Lao PDR, 1999a: 36, Table 32). The responses by province were:

Province	% citing mines/bombs as major problem faced
Xieng Khouang	9%
Savannakhet	3%
Khammuane	2%
Saravane	1%
Sekong	1%
Borikhamxay	1%
All others	No statistically significant response

Xieng Khouang and Savannakhet were the first and third provinces, respectively, in which UXO clearance started, and rank first and second in size of current operations. The high percentages citing mines/bombs as their most significant problem might reflect greater awareness among the populace and officials that something can be done to address the problem, as well as the high level of contamination *per se*.

This scant evidence is far from persuasive, however, and it remains unclear whether UXO clearance will be acknowledged as a national priority. It also is premature to assume increased demands by provincial and local governments for UXO LAO's services mean that UXO clearance is a top priority except in localised situations. From the perspective of village, district, and provincial administrations, UXO LAO is providing "free resources" — officials are not paying for the services either directly from their budgets or indirectly by having to choose between UXO clearance and some other service available via the national government or donor community. Because they do not have to give up anything in exchange for more UXO resources, rational officials will always ask for more UXO resources for their communities.

[55] Of course, they may only have been being polite.

Conclusions

UXO LAO is very much a story still being written. Still, there seems to be consensus among those involved in UXO work on the following critical issues:

- National capacity must be developed to deal with a problem that will endure for many decades;
- In this context, the proper role for implementing partners is capacity building rather than direct management of UXO operations;
- The annual work planning process should continue, and additional measures should be put in place to establish national standards and strengthen national oversight over provincial operations;
- Resources should shift toward clearance activities while seeking more cost-effective means for reducing the risks posed by UXO.[56]

In addition, the analysis done by UXO LAO and the study team indicates that well-targeted clearance activities are likely to be justified on economic grounds alone, and this case will get stronger over time if UXO LAO can continue to raise clearance productivity and as agricultural productivity in Lao PDR increases.

A number of critical issues and questions remain unresolved, including:

- ***What is the true priority of UXO clearance vis-à-vis other development activities?***
  If donors provide funding for mine/UXO channels via special channels, Lao authorities will not see any trade-off between aid for UXO and aid for other development purposes. The same logic applies throughout the decision-making chain: provincial governments, district authorities, village chiefs. Observers are unlikely to get a clear gauge of the relative priority of UXO contamination until decision-makers must choose between allocating resources for UXO or for other purposes.[57]
- ***When should implementing partners end their UXO activities?***
  Current plans call for a measurable phase-out after 2002. Although clear timetables have yet to be established, UXO LAO hopes to shift international support from individual provincial operations to regional centres (i.e., covering multiple provinces). It expects the presence of international advisors in both technical and management capacities for another five years.
- ***Will UXO LAO be able to maintain efficient cost control and high productivity once international staff depart?***
  The Lao government has made some important cost-control decisions, including halting the increase in UXO LAO operations and reducing staff salaries by more than 20 per cent. UXO LAO itself has instituted or plans a number of valuable initiatives, including the cost-capture study and the review of its logistics management. These augur well for cost control. Productivity or performance management is, however, a more challenging task for managers and supervisors, particularly in countries where social norms do not reinforce competitive behaviour.[58,59]

[56] An evaluation of the community awarensss programme has been commissioned by UNICEF.
[57] In economic jargon, until they "internalise" the trade-offs.
[58] The study team was informed there is a common Lao saying to the effect that: "It is the nail sticking up that gets hammered down."
[59] This is not meant to extol competitive behaviour; rather, to point out that social norms which reinforce such behaviour greatly simplify supervision and management.

- ***Can UXO LAO establish the requisite monitoring and evaluation capacity to ensure standards are maintained across provincial operations?***
  The annual work planning process forms a simple and useful framework for UXO LAO provincial co-ordinators and implementing partners to give an accounting for the resources entrusted to them. This can be improved by further development of unit cost analysis. Such accountability structures create powerful incentives for reports to reflect good performance, but these may have perverse effects (e.g., false reporting) unless systems exist to ensure the information reported is both accurate and standardised across all operations.

- ***If UXO LAO continues to demonstrate its ability to manage funds in an effective and transparent manner, will major donors agree to shift funding from their own NGOs and firms to the Trust Fund?***
  Channelling funds via intermediary organisations adds greatly to costs. Some of the high costs for international salaries etc. are warranted for start-up and capacity building purposes; others, such as tying funds to the purchase of unsuitable equipment and services, are simply wasted. While a good case can be made for the burden of proof to be on UXO LAO to demonstrate its performance and probity, at some point donors need to acknowledge that their NGOs and firms have, in fact, helped build the requisite local capacities.

- ***Will donor assistance be maintained at significant levels after most international personnel depart?***
  Most donors recognise there is an international obligation to assist Lao PDR in dealing with a massive UXO problem not of its own making. Understandably, donors are also concerned that Lao PDR has not yet adhered to the Ottawa Treaty. If the Lao government does not adhere in the coming years, will the former outweigh the latter?

- ***If donor assistance declines, will the Lao government maintain the UXO LAO programme?***
  It seems hard to believe the government will abandon its programme completely, given that (1) UXO contamination clearly is a major problem in some areas, (2) UXO clearance is in great demand, and (3) well-targeted clearance appears justified in economic, environmental, and food security terms. However, a significant danger is that, with the many and massive budgetary demands in the country, the programme will be starved of funds, particularly for equipment and supplies. This would quickly sap its effectiveness.

Appendix 3

Case study of Mozambique

Background on Mozambique[1]

The signing of the General Peace Agreement in Rome in 1992 led to democratic parliamentary and presidential elections, which marked the beginning of a new era for Mozambique — one of hope through peace and the opportunity to address the issue of poverty eradication. The next five years saw Mozambique engaging in the establishment of democratic institutions, and in the resettlement of nearly 5 million displaced persons, including an estimated 1.7 million refugees. All this was done while making the transition from complex emergency and humanitarian assistance interventions towards the accelerated creation of an enabling environment for the attainment of sustainable human development. In 1997, the population of Mozambique was estimated at 18.5 million, with an annual growth rate of 2.8 per cent.

More than 60 per cent of the population lives in the rural areas in precarious conditions that are much like those of the majority of people living in cities. Currently, Mozambique's poverty level is characterised by the fact that nearly 60 per cent of the population has an average yearly income of US$100; a life expectancy of 46 years; infant and maternal mortality rates of 120 per 1,000 and 1,062 per 100,000, respectively, and an adult literacy rate of 39.5 per cent. In the *1999 Human Development Report* (UNDP, 1999), Mozambique was listed as one of the world's 10 poorest countries, with a human development index of 0.341, falling well below the 0.463 index for sub-Saharan Africa and 0.430 for developing countries.

According to the national Poverty Reduction Strategy (1995), 60 per cent of the population live below the food poverty line (defined as a daily ration of less than 80 per cent of 2,200 Kcal). The majority, considered to be absolutely poor, live in rural areas, where agriculture is the main source of food and income. With the war ended, one of the principal causes of absolute poverty was eliminated. However, as a result of the war, rural areas now suffer from insufficient economic and social infrastructure, vulnerability arising from adverse climatic conditions, as well as low productivity

[1] This section is largely based on information contained in UNDP's *First Country Co-operation Framework for Mozambique (1998-2001)*, 1997.

levels, which together explain the continuing prevalence of high indicators of absolute poverty. The rapid growth of the urban population during the war was accompanied by the degradation of existing infrastructure and the lack of resources to expand capacity. In urban centres, the decline of purchasing power due to current economic reform, limited employment opportunities, and the lack of social safety nets aggravated the poverty situation.

Mozambique is endowed with a strong natural resource base that offers significant opportunities for development. Almost 70 per cent of the land area, estimated at 800,000 km^2, is covered by savanna and secondary forests, and 45 per cent of the total land mass is arable. Its coastline, approximately 2,700 km long, offers a wealth of marine resources for economic exploitation. Mineral resources, natural gas, and coal represent investment opportunities. Recent strong economic performance has also seen a positive shift in the perception of potential investors towards the country.

As a consequence of measures taken by the government for macro-economic stabilisation and structural reform, favourable climatic conditions, and the cessation of war, the economy has grown vigorously since 1993, except for a decline in 1995. This progression has continued despite the severe flooding that Mozambique experienced in early 2000. Indeed, in August 2000, the Economist Intelligence Unit reported that the economic outlook in Mozambique remained favourable despite the impact of the flooding. The Economic Intelligence Unit raised its forecast for real GDP growth to 7.5 per cent for the year — one of the highest rates in the world — and to 8.5 per cent in 2001. It affirmed that relief on debt service granted by official creditors in response to the floods, combined with the debt reduction under the International Monetary Fund/World Bank heavily indebted poor countries initiative, would substantially reduce debt-service payments and improve the country's debt profile.[2]

Positive economic growth has contributed to the recuperation of the agriculture sector, whose growth potential is important in the government's programme for poverty eradication. Agriculture contributes approximately 30 per cent of GNP and employs an estimated 80 per cent of the work force. Nevertheless, the transformation of the sector will require substantial investment. Notable improvement has also been recorded in the industrial sector after a long period of stagnation. Benefiting from structural reform measures introduced from 1987 onwards, and a strong privatisation programme for state-run businesses and institutions, the industrial sector is beginning to see a turn-around. Strong improvement in the performance of the manufacturing, mining, energy and fisheries industries has been noted — to such an extent that 1996 saw an 11.6 per cent rise in industrial output.

History of mine and unexploded ordnance contamination

The Mozambican landmine problem dates from the mid-1960s. The Portuguese were the first to use landmines in Mozambique, in their battle against the liberation movement FRELIMO (Mozambique Liberation Front) between 1964 and 1974. In 1975, when Mozambique became independent; FRELIMO oriented itself towards Marxism and soon after was challenged by RENAMO (Mozambique National Resistance) in a brutal war (1977–92).

[2] "Mozambique: Floods fail to dampen economic prospects", *United Nations Integrated Regional Information Networks*, Johannesburg, 3 August 2000.

Most of the landmines in Mozambique were laid either by the FRELIMO government forces or RENAMO opposition between 1978 and 1990. The government mainly used landmines defensively to protect important infrastructure and strategic sites from RENAMO forces: minefields were also laid along the borders with Malawi, South Africa, Zambia and Zimbabwe. RENAMO, on the other hand, sought to weaken the government by targeting the economy: in this strategy, landmines played an important role in its attacks on major infrastructure, particularly the road system. Like the FRELIMO government, RENAMO also used mines to protect its military bases as well as villages under its control.

Both FRELIMO and RENAMO used mines randomly, and both have been accused of using mines to terrorise civilians. The US-based NGO Human Rights Watch, for example, has reported instances where the fear of landmines was exploited to terrorise civilians — including people being told about the presence of landmines where there were none. Landmines were used to cut off access to food — through the mining of paths to fields, water sources and fishing points, or by hindering the delivery of food aid (Roberts and Williams, 1995:211-212). RENAMO also used mines to prevent displaced people from returning to their homes.

Mozambique's landmines were supplied mainly by the Soviet Union, but also by Rhodesia/Zimbabwe and South Africa. The insurgency forces in Mozambique developed expertise in lifting and re-deploying mines from government minefields, a practice that was popularly called "fishing".

The war ended with the Rome Peace Agreement of October 1992, leading to multiparty elections two years later. The United Nations Operation in Mozambique (UNOMOZ) was set up to oversee the two-year transition period. By and large, since the end of the war there have been few reports of new mines being laid in Mozambique (Human Rights Watch, 1997:72) However, in the first few years after the Rome Agreement, both parties to the conflict were accused of limited planting of new mines, at times with the aim of slowing down the ongoing humanitarian demining process.

Early assessments of the landmine issue in Mozambique pointed to a massive problem; as a consequence, the country was categorised — together with Afghanistan, Angola and Cambodia — as one of the most severely mine-affected countries in the world. Estimates of the scope of the problem have since been modified, and there is now general agreement that the mine problem in Mozambique is far more manageable than had been predicted in the first half of the 1990s. Accordingly, landmines no longer figure at the top of the list of obstacles to the country's reconstruction.

Table 1: Estimated Numbers of New Mine Victims (dead and injured) in Mozambique, 1995–1998

1995	600–720 (rough estimate)
1996	126 (reports from 6 provinces)
1997	69 (from 7 provinces)
1998	83 (all 10 provinces)

A frequently used indicator of national landmine impact has been accident statistics, which capture one central component of the costs to the population. But although accident rates may be a central issue at the emergency stage of reconstruction, they are less helpful in the establishment of mid- and long-term priorities. Reports of mine accidents from HI, and the national mine awareness programme that it co-ordinated, suggest significant reductions in accidents from 1995 to 1998[3] (ICBL, 1999:61). But the figures are highly inaccurate, and victim rate is too narrow an indicator of the socio-economic impact of mines. In addition, the most recent estimates show a continued decline, with around half of all accidents caused by unexploded ordnance not mines.[4]

The accident data — as well as other more loosely founded assessments of the mine problem in Mozambique — have led some analysts to conclude that the most pressing mine problems in Mozambique will be effectively dealt with by the year 2005 to 2007 (Agenda, 1999:74). Such a conclusion might appear overly optimistic given the number of mined areas that remain in Mozambique. This does, though, indicate how the landmine issue is undergoing redefinition, which has led to a lower ranking among the country's reconstruction challenges than was previously the case. This places current operators in a delicate position — until now funding for mine action has been relatively generous; however, as the landmine problem is redefined, operators may run into severe funding problems given that operational costs will remain high.

Yet, landmines continue to pose a serious problem for many communities across Mozambique and remain a problem for rebuilding or maintaining important infrastructure. A substantial demining capacity will therefore be needed for many years to come. However, the priorities will appear to be less pressing, and it will be necessary to restructure organisational responses.

History of mine action in Mozambique

The 1992 Rome Peace Agreement referred to the importance of humanitarian assistance as an integral part of peace-building, but made no specific reference to mine action as such. However, there was already a certain awareness of the existence of a mine problem in the country, although it proved difficult to qualify this assumption any further at that stage.[5] The United Nations Secretary-General emphasised the integration of all components of the Mozambican programme. This indirectly led to the politicisation of demining decisions and delays in getting the programme off the ground. In these early days, mine clearance was dealt with by the Cease-fire Commission, which included representatives of both parties to the conflict — FRELIMO and RENAMO (Eaton et al., 1997:11-12). This proved to be a major constraint to clearance efforts, since both parties were hesitant to the idea of humanitarian demining.

A preliminary plan of action was developed as early as January 1993, although the parties to the conflict did not approve it until November of that year. The priorities

[3] It appears disputable whether demining should be credited for the reduction in accident rates. A 1998 IDRC consultant suggested that the main reasons were that "there are no longer large population movements, there is better knowledge of mined sites, and the mine awareness programmes are paying off" (Rebelo, 1998).

[4] Information provided by HI to Ted Paterson.

[5] When the United Nations Department of Humanitarian Affairs asked the United Nations Special Co-ordinator of Emergency Relief Operations in Mozambique for information about the landmines problem in July 1992, the response was that precise information was impossible to gather before the cease-fire had taken effect (Eaton et al., 1997:11).

outlined in the first plan were to open roads — in order to facilitate the repatriation of refugees and internally displaced persons, as well as to make possible humanitarian aid delivery (ICBL, 1999: 47) Due to its primary emphasis on supporting the UNOMOZ peace mission, the plan has since been criticised for focusing on emergency-oriented objectives (Eaton, 1997:14). Such a focus allegedly resulted in a failure to recognise the need for long-term demining in the country. In addition, little attention was placed on the needs for comprehensive data gathering and the establishment of sustainable indigenous capacities.

Having addressed the most immediate problems with the political parties, the UN faced another constraint from the donors' side. The United Nations wanted to establish an implementing unit of its own, to be converted into a national capacity at the termination of the UNOMOZ mission. The United Nations proved unable to build donors' support for their plan, but was unwilling to compromise, convinced by its initial assessment that the national body should have not only planning, but also operational capacity. On the other hand, it was also a problem that several donors were working to secure demining contracts for specific NGOs or commercial operators. The 1996 United Nations Department of Humanitarian Affairs (DHA) report *Mozambique: The Development of Indigenous Mine Action Capacities* suggests that the lack of ability of the UN and donors to reach a consensus was the major reason for the failure to establish a functioning central co-ordinating mechanism (Eaton et al., 1997: 18-21).

The first organisation to establish a demining capacity was NPA. The first NPA clearance team arrived in March 1993 and established itself in Tête province, from where NPA was already running a development programme. NPA started actual demining in August 1993. Operating in what was seen as an emergency context, priorities were set by UNHCR, which was co-financing NPA's work during its first year of operations. Areas for clearance were selected on the basis of expected refugee return, but with insufficient attention to the constraints posed by NPA's limited capacity (Hallam et al., 1997:80). NPA has since become one of the main mine action operators in the country, being responsible for most of the demining in the central and north-western provinces of Manica, Sofala and Tête.

The HALO Trust started a base in mid-1993, initially to carry out a national survey of the mine situation under a contract for the UN Office for the Co-ordination of Humanitarian Assistance (UNOHAC). The HALO Trust survey, commissioned by UNOHAC, did not cover the whole country. In fact it only recorded 981 mined areas of the 1,761 registered in the National Mine Clearance Commission's database by early 1999 (ICBL, 1999:53). The survey was completed by late 1994, and remains — in spite of major criticisms — the only national level minefield registration to date. Perhaps its most significant shortcoming is that it did not in any way address the socio-economic impact of landmines in Mozambique. HALO Trust also started to establish itself as a demining operator, carrying out – with funding from the British Overseas Development Administration — clearance linked to the activities of three other British NGOs. HALO Trust is the dominant operator in the north, where it covers the Niassa, Nampula, Cabo Delgado and Zambezia provinces.

But while NPA and HALO Trust became operational, the United Nations was still unable to get started. By mid-1993, the decision had been taken to invite tenders for a US$12 million road clearance contract as a first step in the United Nations-facilitated national plan. In July 1994, an international consortium consisting of Royal Ordnance

(UK), Mechem (South Africa) and Lonrho (Mozambique) was given the task, after a fine-tuning of the formalities within the United Nations system had caused substantial delays (Eaton, 1997:20). The decision to award the contract to the consortium attracted considerable criticism, not least due to the involvement of the South African company Mechem, which was accused of "double dipping" on account of its involvement in landmine development (Human Rights Watch, 1997:85). However, thanks to Mechem's unique vapour detection technology, the project succeeded in clearing 2,051 kilometres of road by December 1994 (Harpviken, 1997:92–93).

It was only towards the end of 1994 that the United Nations's Accelerated Demining Programme (ADP) commenced its activities in the southern provinces. Through ADP a demining school was established, although by then the other agencies had already established their own training facilities in the absence of a United Nations capacity. ADP was originally criticised for concentrating on mine-dense fields at the exclusion of examining socio-economic impact (Human Rights Watch, 1997:88). Moreover, early tasks were in logistically favourable areas, in towns or close to Maputo.

The future of ADP was discussed in 1996, with alternatives being conversion either into an NGO or into a government agency (Eaton et al., 1997:31-32). This controversy — with donors and the government on opposite sides — has only recently been resolved.[6] As things stand, ADP retains a somewhat ambiguous status as a parastatal organisation, though it operates with substantial UNDP support, and is effectively under United Nations management.

When UNOMOZ withdrew in December 1994, there was no authority in place to take over the co-ordination of the national mine action effort. The National Mine Clearance Commission (NMCC)[7] was established in May 1995. The mandate of the NMCC was, among other things, to co-ordinate operations, maintain the national database, develop strategic plans, as well as to set procedures for prioritisation. The new body included the representatives of seven ministries, with the Minister of Foreign Affairs and Co-operation as its President. In the long term, NMCC proved unable to develop the capacity to set national priorities (Hallam et al., 1997:81).

More generally, the United Nations has been heavily criticised for its slow progress in building up an effective demining capacity in Mozambique. It has been suggested that strong central authority has been a major obstacle to getting operations off the ground (Hallam, 1997:82) The establishment of relatively independent NGO capacities in Mozambique, which persists today, can largely be seen as a reaction to the slow United Nations response. The DHA report from 1997 points out that: "The absence of reliable data on high priority minefields, compounded by the absence of a central co-ordination mechanism, is likely to result in many high-priority minefields not being addressed in a timely manner and effort and resources being expended on areas that are not mined" (Eaton et al., 1997:23).

The "National Mine Clearance Strategy Approach" of November 1998 suggested that the National Demining Institute (IND), a new para-statal institute, replace NMCC (Government of Mozambique, 1998d). IND was to enjoy larger autonomy from ministerial control and be closely linked with the establishment of a national demining

[6] ADP will become an NGO, though the precise timing of the institutional transformation is not yet known.
[7] NMCC is also known under its Portuguese acronym: CND.

Table 2 - Main mine action operators in Mozambique[a]

Operator	Type	Main tasks	Start	End	Funds 1994 - 2001 (US$)
Gurkha Security Guards (GSG)	Commercial (British)	Road clearance	Jan 93	Feb 94	
Handicap International (HI)	NGO (French)	Mine awareness "Proximity demining" (from Feb 98)	June 93		5,134,000 (5.5%)
Norwegian People's Aid (NPA)	NGO (Norwegian)	Training area clearance Road clearance	July 93		20,100,000 (21.5%)
Mine-Tech (Zimbabwean)	Commercial	Road clearance Power lines/Railway lines Area clearance (with GTZ development programme)	Dec 93		1,952,000 (2%)
HALO Trust	NGO (British)	Survey (The 1994 Level One Survey) Area clearance Road clearance	Jan 94		3,791,000 (4 %)
RONCO (USA)	Commercial	Road clearance with dogs (transferred dogs, equipment and personnel to NPA upon completion)	Jan 94	Jun 95	10,000,000 (10.5%)
Mechem	Commercial (South African)	Road clearance Area clearance	Feb 94		4,200,000 (4.5%)
National Mine Commission (NMCC)	Government	Data-collection & analysis Clearance Priority procedures Monitoring Co-ordination Standards Oversee mine-awareness programme	May 95	Jun 99	10,207,000 (11%)
Accelerated Demining Program (ADP)	UNDP with Government	Road clearance Area clearance	Oct 95		20,030,000 (21.5%)
Special Clearance Services (SCS)	Commercial (Zimbabwean)	Area clearance	mid 96		4,813,000 (5%)
Carlos Glassman Technologias de Vanguarda Aplicadas Lda. (CGTVA)	Commercial (Portuguese)	Quality Assurance for NMCC	97		
CIDEV (French) (French)	Commercial	Power lines clearance	Jun 98	Dec 98	3,158,000 (3.5%)
Canadian International Demining Center (CIDC)	NGO (Canadian)	Survey Level One (within the Survey Action Center framework)	99		
National Demining Institute (IND)	Government	Replaced NMCC, but with more autonomous position, and linked to the establishment of FUNAD, the National Demining Fund	June 99		
Afrovita	Commercial (Mozambican)	Road clearance	99		

a In addition to data gathered by AMAC, the table draws upon information from the following sources: Human Rights Watch, 1997; ICBL, 1999; Roberts and Williams, 1995.

fund, FUNAD. Again, donors have proved sceptical, not only because they have been hesitant to lose control over funds, but also because IND's ability to establish authority over the mine action domain is seen as doubtful.

One distinctive aspect of mine action in Mozambique has been the extent of commercial involvement.[8] By 1997 as much as 45 per cent of the total funding had gone to commercial companies (Eaton et al., 1997:30). The percentage of commercial companies appears subsequently to have fallen substantially. In total they are estimated to have received between 26 and 30 per cent of the funding for the whole period 1994–2001 (ICBL, 1999:51) In addition to the 1994 UN-funded road clearance described above, South African Mechem and Zimbabwean Mine-Tech jointly took on a large commercial contract to clear parts of the Cahora Bassa power line.

Humanitarian agencies also continue to sub-contract commercial companies for demining. The German Agency for Technical Cooperation (GTZ) has hired Mine-Tech — which has also been contracted by UNICEF and UNHCR — for the demining component of its integrated development projects in Manica province. Another Zimbabwean Company, Special Clearance Services, has been contracted by humanitarian donors, including UNICEF, the European Union and the World Bank. There has been less and less criticism of the technical quality of the commercial demining.

Little attention has been paid to the mine clearance conducted by Mozambican armed forces. In fact, the government started mine clearance during 1993, and in 1994 the new joint defence forces received some demining training from the French military (Human Rights Watch, 1997:84). The armed forces have also received some training from the United States military.[9] The *Direcção Nacional de Estradas e Pontes* has also been active in clearance, hiring demobilised soldiers as deminers.

From early 1998, Canada started to explore the need for a more comprehensive Landmine Impact Survey in Mozambique. Canada established a dialogue with the Survey Action Center. With Canadian funding, it eventually became clear that the Canadian International Demining Centre (CIDC) was to be the implementing agency in Mozambique for the SAC. After a slow start, further delayed by the serious flooding in the south of the country,[10] the Landmine Impact Survey is under way.

In several mine-affected countries there has been considerable "self-help demining" — in the sense that private individuals have cleared on their own initiative, with no institutional back-up. This is definitely a high-risk activity: a 1995 cross-national study concludes that the risk of falling victim to a mine increases about fourfold if you "tamper" with mines (Andersson et al., 1995). Interestingly, the same study finds that this is almost a non-existent problem in Mozambique, as opposed to other countries in the study. The finding is consistent with observations from mine action personnel with experience from different countries. It seems that people are less inclined in Mozambique to attempt "self-help demining", and in general have higher respect for the risks associated with mines.

[8] There are now six Mozambican or joint venture companies working in mine action in Mozambique. Information provided by Ted Paterson.
[9] Information provided by Olaf Juergensen.
[10] Information collected by PRIO research team.

HI started mine awareness in 1993, both for rural populations and for returning refugees. It was in charge of mine awareness education in the country until January 2000 and during that period, it co-ordinated the so-called National Co-ordination Programme of Education Activities to Prevent Mine and UXO Accidents (ICBL, 1999:60). Partners in the programme were the national Red Cross society and the Ministry of Education, in addition to a range of other organisations at different levels. The programme was based on district-level mine awareness committees with one HI co-ordinator at the provincial level.

There seems to have been a low level of integration between mine awareness and demining in Mozambique. The 1997 DHA study accuses demining NGOs of having marginalised mine awareness, which it recognises as "a continued illustration to programme managers and policy makers of military tendencies that focus on the technical response to the mines threat while resisting the concept of integrated mine action" (Eaton et al., 1997:37). In other countries, demining units sometimes perform mine awareness as a means to conduct an ongoing dialogue with locals about the local mine problem and about the operation. As from 1 January 2000, the National Co-ordination Programme has closed. A new Mozambican mine awareness programme will include the old parties to the programme, but the responsibility will rest with the National Demining Institute.

More recently, HI has engaged in demining. It works in Inhambane province and has developed a concept called "proximity demining". The basic premise is that there is a need for a different organisational response in an area where most of the mine problem consists of scattered mines that were originally aimed at the local population. HI teams are small and flexible and clear areas that they perceive as being of great importance locally but which would nonetheless be ranked low in national priorities. This approach fundamentally exposes the irrelevance of conventional efficiency measures, such as cost by area — a measure on which "proximity demining" would lose out.

Likewise, HALO Trust — which envisages that it will withdraw within the next couple of years — has also started to think about how parts of the capacity it has developed can be restructured to be functional in a new situation. In Niassa province two years ago, for instance, it set up a small provincial level "demining fire brigade" to work on low priority tasks. Similar thinking about "fire brigades" is also contained in government documents (Republica de Moçambique, 1998:9).

Recently, the IDRC has been working with the Mozambican National Demining Institute in designing a methodology needed to bridge the local skills gap so that mine action programming can also contribute to national development, decentralisation, and governance issues. Based on this interaction, research reports and stakeholder feedback, IDRC has been refining the Integrated Mine Action Development Strategy (IMADS) concept with plans to pilot test in Nampula Province in late 2000. Based on a review of the pilot, a national IMADS will be developed for Mozambique, and a project start date is envisioned for the first quarter of 2001.[11]

[11] Information provided by Olaf Juergensen, IDRC Johannesburg.

Mine action within reconstruction: Room for co-operation

The reconstruction effort initiated by the 1992 peace settlement linked closely to the World Bank structural adjustment package begun in 1987. Mozambique has had to counter the dual challenges of post-war reconstruction and the reorientation of its political economy from centralised planning to market economy. Mozambique's economy has seen considerable improvements since 1992, although a high percentage of the country's population are among the most poverty-stricken in the world.

Broader overviews of Mozambique's economy are not particularly concerned with landmines. In fact, no mention of mines was made at a June 2000 Consultative Group meeting—the most important government/donor consultations of the year. One of the country's key challenges is its massive dependency on foreign aid, with as much as two-thirds of imports being financed by aid in 1996. One central implication of this aid dependency is that government capacities are stretched to the limit in dealing with the special concerns of the variety of aid providers, in itself a major obstacle to developing independence in the longer term.

Returning to mine action more specifically, lack of co-ordination with other kinds of relief and development programmes appears to have been a staple of the effort in Mozambique. One example is when an NPA team spent three and a half months to clear 41.5 km of road in 1994, but the road remained out of use owing to lack of rehabilitation (Hallam et al., 1997:80). This is but one of a number of examples where the failure to follow up demining with other activities has prevented any short-term impact of the investments. However, the conclusion that mine action and reconstruction co-ordination has been poor in general – and nearly absent at the national level – must not prevent us from identifying positive steps taken at local levels.

From 1998, NPA started to include community services – in the form of Quick Impact Projects — in the demining sites where it was working. The idea is to take advantage of the presence of the mine action operation in a community to provide limited services, such as securing access to water, repairing a bridge or providing basic medical assistance (Agenda, 1999:62). An additional motivation was that this contributed to improving relations between demining personnel and the local population.

But NPA's 1999 Agenda evaluation raises the concern that an additional project component might take the focus away from the basic task of communicating about the demining process itself. The report fails to reflect upon the potential benefits that the arrangement could have for the impact of demining. In the same report, the very sustainability of the Quick Impact Projects is questioned — many of the projects seem to require follow-up beyond the mine action engagement.

Another exception to the general rule of poor integration between mine action and other programmes is the projects of GTZ, which explicitly aim to integrate demining within a larger development effort. Zimbabwe-based Mine-Tech conducts the demining for the GTZ projects. These organisations argue that co-ordination is key throughout the project cycle. For example, the basic survey is set up as an extended mine awareness exercise, in which the purpose is to gather not only landmines information but also information for planning reconstruction efforts more broadly (Mine-Tech, 1998:3).

There is, though, certainly potential for a closer co-ordination between mine action and other reconstruction efforts. But there are limitations in the capability of mine action organisations taking a leading role in co-ordinating development-oriented activities in a project area, one of them being that mine action organisations rarely stay long enough in one area.

Overall, it is clear that the process of reconstruction in Mozambique has come out of an emergency phase, and that the current challenge is to foster mid- to long-term development. This is as valid for mine action as it is for reconstruction in general. However, it seems that mine action, perhaps to an even larger extent than other reconstruction sectors, has failed to adapt to changing circumstances and remains focused on short-term priorities. The problem links with the larger issue of not realising that impact results from the way the operation is conducted, not just from the physical removal of mines.

Approaches to setting priorities for humanitarian demining in Mozambique

This section refers to findings from three community case studies conducted in Mozambique between 16 February and 21 April 2000.[12] The community studies are complemented with material from a few shorter site visits. We will also make reference to a 1999 AMAC community study in Bandua, in Sofala province (Millard, 2000:420).

The first of the three village studies was located in Nairoto, in Cabo Delgado Province. HALO Trust launched that clearance operation in 1999 and it is now close to completion. Nairoto is provincial priority number two; the expected socio-economic impact is not high, but the operation draws interest because of strong agency-community relationships.

The second village studied was Capirizanje, Tete Province. This area was cleared of mines between 1994 and 1995 by NPA. The operation was launched in response to a request by UNHCR, because the mines in the area were thought to pose considerable threat to returning refugees. The case study found that the impact goes far beyond what was expected. The cleared land has become particularly important as a settlement area for returning refugees from Malawi.

The third case was Nacala, in Nampula Province, where HALO Trust has an ongoing operation. The Nacala task is ranked ninth at the provincial level. The minefield is very large (expected 8 kilometres by 20 metres); the rationale is to open access to enable maintenance of a functioning water pipeline that serves the town at Nacala port. The Nacala task has been motivated by macro impact, and little attention has been paid to securing impact at the local level.

General survey and preliminary ranking of mined areas

A Landmine Impact Survey is an effort to get an overview of the landmine situation in a country. In Mozambique the 1994 HALO Trust survey, complemented by smaller

[12] A brief outline of the methodological framework is (Harpviken and Millard, 1999), which can also be found at the following website: <http://www.prio.no/amac>.

survey efforts of new minefields, has been the main instrument used to date. It contains exclusively technical minefield information, with no data on impact. The ongoing CIDC Landmine Impact Survey represents a different line of thought with a heavy emphasis on socio-economic data. Demining organisations are critical of this because they feel that the CIDC survey will not give them the information they require to assess whether, given individual organisational constraints, it is practically possible to take on a task. While the authors think socio-economic impact is essential, the need is, of course, acknowledged for organisations to collect technical information. It remains an open question, however, whether detailed technical data is a necessary component of a Landmine Impact Survey, or if such information should be collected at a later stage.

In practice, there has been a tendency by operators to place constraints at the forefront of priority setting. One example of this is the Songo minefield in Tête province, the selection of which has been criticised in several evaluation reports (Agenda, 1999:31-33; Hallam, 1997:81). This minefield was laid to protect the Cahora Bassa dam in the 1960s. Demining started in September 1995. Although the socio-economic impact is potentially large, the task is huge and — in spite of continuous work by one or two platoons since 1995 — completion is not in sight. By 1997 the operator admitted that the Songo task was not the highest priority, but argued that as a mine-dense field it is a good training ground.[13] Since then, considerable capacity has continued to be tied up in Songo. This serves as one example where prioritisation seems to have been motivated by organisational constraint (i.e., the need for a mine-intensive training site), rather than by overall socio-economic impact.

The national policy for priority setting is outlined in *The National Mine Clearance Strategy Approach* from November 1998, and still seems to be the principal foundation on which a nationwide priority setting standard should be set. Here, priorities are ranked by type of task, which includes considerations about level of impact (i.e., community to national). There are three categories, high, medium and low priority, each with three sub-categories. It has proved difficult to establish the extent to which those criteria guide agency priority setting in practice. Overall, priority setting does not occupy a central place in agency documents. The ADP's recent 17-page project document has little to say about impact assessments and priority setting. This is the full section on "Prioritisation of ADP clearance tasks":

> *Task input is sought from national (National Demining Institute), provincial, and district level authorities, with a final yearly list of clearance priorities submitted to the National Demining Institute for confirmation. Although broadly based on stated national priorities for landmine/UXO clearance (i.e. access roads, water points, schools and health centres, agricultural land, economic infrastructure), the actual determination of clearance priorities is, in practice, left largely to local* (i.e. *provincial) discretion.* (UNDP, 2000:7-8)

As the ADP document indicates, priorities are normally set in some sort of dialogue with provincial authorities. HALO Trust, for example, gives a list of surveyed areas to the provincial administrator, who comes back with a ranking of priorities which is then held against HALO's own ranking. The overall impression is that in this final decision-making phase of establishing priorities, there is little or no reference made to the national indicators. Nonetheless, those indicators do figure in the survey forms used by most organisations, and hence they do, to some extent, affect the ways

[13] Information collected by PRIO research team.

organisations rank priorities. In practice, ranking seem to be established on the basis of relatively rough and impressionistic accounts of impact, particularly since the information underlying decisions is limited.

Since the Landmine Impact Survey is supposed to cover all mine-affected areas within a country, there are clear limitations on how detailed the information gathered can be. In Mozambique, with some 2,000 mined sites, the general survey must rest upon the formulation of simple and standardised indicators. The weight given to the various components, though, is open for discussion. The role of each component should reflect the character of the mine problem in that particular country, and the kind of effort that has been made to deal with the problem, if any. A review of survey forms devised by CIDC for the socio-economic survey indicates that accidents are given 30 out of a maximum of 60 points. Within this system, any community that has had a mine accident in the past 12 months will belong to the highest of three impact categories, "Very Severe", which is the case for any score above 14 points (Canadian International Demining Centre, 1999).

In two of the four communities that we have studied in Mozambique, we found that mine accidents were most likely to have happened in the past 12 months before operations started. However, in both cases the accidents were "one-offs" rather than part of a larger trend. The primacy given to accidents seems particularly surprising given that Mozambican demining is long past the emergency stage. According to CIDC officials, the ranking criteria are undergoing revision, yet the instrument originally devised illustrates more broadly the problems with developing simple measures to say something about complex social processes.

Detailed survey and the selection of mined areas for action

The Impact Survey might establish socio-economic indicators, and these serve as a basis for selecting cases for further scrutiny. However, the data contained in a Landmine Impact Survey is very rough, and hence a more comprehensive analytical exercise is needed to make informed decisions about whether to take on the task, and, if so, how it is to be done. A few illustrations follow here, identified from case studies in Mozambique, as to the importance of making a more comprehensive socio-economic impact assessment prior to operations. These are issues not addressed by the current Impact Survey design.

First, there is the general issue of conducting operations with a focus only on "automatic impact", seeing impact as being largely equivalent to the physical removal of mines. In the Nairoto case, there was very little impact of this kind. The minefield posed no economic strain on the community, the area being demined having long since been defined as unattractive for cultivation due to low fertility. The potential for accidents is minimal. There has been one mine accident in the area, but the person killed was mentally disturbed and entered the minefield in spite of the known risk. Nonetheless, the Nairoto operation is likely to have a major impact, primarily because it allows the local population to reassert ownership of the administrative centre from which they have been repeatedly driven out.

The story dates back to the 1950s, when the Portuguese made locals settle closer to the administrative centre in order to protect them from the war, but also to prevent them from joining the independence movement. However, while the local population was forced to move closer to the Nairoto administrative post, they were, by and large,

forced to live outside the village administrative centre. After the Portuguese left, the locals took control of the village administrative centre by expanding their settlement area. Later, during the civil war, the locals were forced to flee, and upon return they found that the perimeter of the administrative centre was mined, so again they were forced to settle outside. In spite of the whole perimeter of the village being mined, locals gave preference to clearing the Nairoto 1 and Nairoto 2 minefields, which are the ones that currently hinder existing residential areas from expanding to include the administrative centre. This operation is important because it is assisting a population with a long history of political marginalisation to reassert ownership of the territory it sees as its own.

Secondly, the impact of any one particular factor depends on the extent to which people have alternatives. Many mine-affected communities in Mozambique have developed ways to compensate for the fact that certain areas or resources are unusable due to mines. In Nairoto, the demining operation will give more easy access to the village centre, and allow expansion of the settlement. However, access to the administrative centre is not contingent on demining, since there is already a wide trail linking it to the residential area. Both sides of the trail are mined, yet it does provide safe access to and from the village administrative centre. The point to note is that since people are not totally dependent on demining to have access to the village centre, they will need a high level of confidence in order to use the cleared areas. For organisations, it is essential to know the degree to which affected people are dependent upon the resource that is being freed through demining.

Thirdly, and closely connected to the above, is the question of being able to contextualise one's work, by seeking to understand the perspectives of those being affected by the operation. The Capirizanje operation is interesting. The area selected for demining was relatively large, and it was close to the road linking Tête City to the Malawi border at Zobue (i.e., the Capirizanje village is five kilometres from the Malawi border). The area was populated before the war. For refugees in Malawi, who had little confidence in the peace process, Capirizanje was an ideal place to return to, since it enabled them to keep open the possibility of a safe exit. Thus, although the initial motivation for the operation was to facilitate the return of refugees that would pass through the area, and to reduce the accident potential, a key impact was to allow for the resettlement of returning refugees.

More generally, operators need to be able to identify the impact that an operation will have for the local population. The Nacala operation was launched to demine eight kilometres of water pipeline, which is the only source of fresh water to the city of Nacala port; hence the operation's primary impact is on a wider scale. However, the area where the minefield lies is populated, hence the operation will also have a small-scale impact. In this case the operator has concentrated on the wider impact, largely disregarding the effects for local residents. While locals have developed alternatives, such as new areas for cultivation or for production of coal, the failure to factor in local impact represents considerable lost opportunities. A different example is from Capirizanje, where Bairo Samoa, across the road from the minefield, suffered from severe land subsidence due to bad water drainage. People fearing that homes and animals would fall into the craters were under considerable pressure to relocate to the demined area. Opening up for local relocation of the Bairo Samoa population became a key impact of this operation, yet one that was unidentified prior to the operation.

Hence, the conduct of thorough impact assessments prior to setting final priorities is necessary. This implies that organisations will have to invest in studying mine tasks that may eventually not be taken on. The requirement for analytical capacity therefore goes beyond attaching an analytical component to existing units. Furthermore, organisations need to develop the courage to invest in socio-economic analysis of tasks that may not become project areas. This requires not only capacity, but also a planning horizon longer than that of most present operators.

As should be clear by now, there is immense variation between different demining tasks, a variation that cannot be grasped by the rough nature of indicators applied in the general Landmine Impact Survey. The detailed impact assessment therefore needs to have as one objective the development of indicators that reflect the particular factors that are key in the specific case. Such indicators are essential to give focus to conducting the operation, and will serve as a basis for monitoring and evaluation. Locally-defined indicators do not replace standardised indicators but rather complement them. Standardised indicators by necessity only address a minimum common core of issues across all cases. We can easily imagine cases where landmines have a severe impact but where this impact is not registered because it is not addressed by the standardised indicators.

The process of defining local indicators can also be used constructively to engage stakeholders in discussing the design of the operation, as well as its expected impact. This is valid regardless of whether the project has its main impact at the micro level or at the macro level. However, in the former case it would seem sensible to engage the local population, whereas in the latter case one would most likely relate to selected representatives. In any case, the engagement of the affected population in the definition of indicators serves a dual purpose: not only does it ensure that the project is geared towards responding to locally defined needs and capacities, it also contributes to strengthen the population's feeling of ownership in the project.

Conducting the operation and increasing the benefit-cost ratio

In order for benefits to be increased in relation to costs, operators need to have in-depth knowledge of the area in which they are to work. They also need to have the ability to further their knowledge of the area while they are working. The latter issue is central if operators want to be able to adapt to the changing dynamics in the area. Central to the reinforcement of an organisation's understanding of socio-economic impact is the need to build strong relationships with the community.

Most basic is the need to understand how the resources freed by demining will affect the distribution of wealth, and if power relationships among the population are affected by mines. Land ownership is a good case in point, being an important theme in most clearance operations. It is the authors' experience that operators rarely establish knowledge of land ownership prior to clearance.[14] Yet, the question of land rights is both a staple issue and one that often leads to disputes; hence any organisation entering the local scene to free up resources must have basic knowledge of local land tenure systems.[15]

[14] NPA Cambodia has done interesting work in this regard, focusing on how land ownership can be clarified, and in fact judicially established, prior to demining (Harpviken et al., 1999).
[15] Mozambique has a new national land law in place since 1997. Information provided by Olaf Juergensen.

In Nacala, all the minefield area belongs to one extended family. This is common knowledge among the population and there is no sign that land rights are disputed. It is interesting to note, though, that everybody is allowed to cut wood for sale, or to produce coal in this area. In this particular case, one could imagine the operation falling into disrepute since it only benefits the family that owns the land. On the other hand, there are also reasons to think that everybody benefits, since the area is available for the productive use of other community members in addition to the owner. The basic point is that unless an operator knows the context well, the potential exists for causing harm. Knowledge and understanding of local relations is key; the operator must ensure that the local population understand the goals of the task.

Land rights have not been an issue of dispute in either Capirizanje, Nairoto or Nacala, but in Bandua they were a potential source of community conflict. (Millard, 2000) Although rules for land tenure in Bandua are quite similar to those in other areas of Mozambique, the issue of who would be able to relocate to the mined area once the operation was finished was the source of confusion and contradictory accounts. A variety of different scenarios were posited as the chain of events that would succeed the hand-over of land, but it became evident that no one actually knew what would happen. There is a common perception that the land being freed is agriculturally rich, hence gaining access to parts of it will be very attractive. Under circumstances such as these, it is easy to imagine that powerful actors in the community will take advantage of their position and establish ownership over the land upon completion of clearance.

Contact with the community is often limited to the use of one single community representative. Any external actor treads a fine line between respecting local authority relations, while also maintaining diverse enough contacts to safeguard against severe misuse or manipulation of information. At times, as when entering a local community with a highly legitimate leader, relating to only one person might work reasonably well. In Nairoto, the operator had established a strong relationship with one individual who does not belong to any official administrative system. This person lives in the area, he is in charge of mine awareness locally, and regards it as part of his duty to inform the population about the local landmines situation. His effectiveness in brokering information between the organisation and the local population was compounded by the fact that this was a community with low levels of conflict and with a smoothly working administrative system. Hence, the diffusion of information worked relatively well, without the organisation having to invest heavily in working with a range of locals.

Focusing specifically on relations with local leaders, operators need to pay attention to the fact that local leadership is not standardised across communities. In Mozambique, some operators have been focusing on the *Regulo* (a traditional administrative figure in Mozambican society) as the standard community representative, but in fact there are many areas in which the *Regulo* holds little or no power, and performs no community functions. In such cases, establishing contact with the *Regulo* exclusively can entail a risk to the whole operation.

In general, then, liaising with only one community representative is not enough. First, it entails the risk of becoming severely dependent on one individual, who may be subject to manipulation. More importantly, increasing benefits relative to costs is only possible if broader relationships with the population are established. The Nairoto village, as has been seen, is a case where the "automatic impact" is very limited.

However, due to the operator's investment in good community relationships, the operation had a substantial social impact at the local level. The strong organisation/community relationship is paralleled by strong local confidence in the clearance operation. Now, there are several reasons behind this situation: Nairoto is an isolated place; hence deminers living there have few alternative places to go. Importantly, the minefield is very visible; hence the population can actually follow the work and progress of the deminers. The trail that passes between the minefields is regularly used, but when a mine is blown up, it is closed, and people are prevented from passing. This arrangement in itself requires communication, and it makes people very aware of the work that is going on.

For community relationships to be good, stability of organisation staff is a prerequisite. Whereas all organisation staff should see that good local relationships are upheld, the role of the supervisor is normally a key one. In the Nairoto case the supervisor had very good relations with the villagers. When the supervisor was changed, people in the community felt that the relationship with the mine action operator was potentially in danger of disintegrating simply because they "did not know" the new supervisor. In this case it would have been wise to make sure the old and the new supervisor had a short transition arrangement. The Songo example is a more extreme case of the same. Here, the operator rotates platoons through the area, with one platoon replacing another at six-week intervals. This system reflects the use of Songo as a training site for deminers since it is so mine dense. However, on the cost side, the local population had no regular interlocutor within the clearance organisation. Aside from whether Songo is truly a high priority, it would have been advisable to ensure that, when rotating teams, at least a core staff with a senior community liaison function were permanently on site so that relationships with locals could benefit from some continuity.

The broad issue of community relationships is closely linked to the more specific issue of confidence in clearance. In many cases it takes a long time for the population to exploit the cleared areas, and it seems that this is often linked to confidence in clearance. One example is Capirizanje, where clearance was completed as early as 1995 but it took at least two years for people to start using the area, seemingly because of lack of confidence that the area was truly safe. Such delays in taking demined territories into use are not rare in Mozambique. It is believed that this is related to the routines that demining organisations have for establishing confidence in cleared areas. Confidence-building is often linked to a one-off hand-over event, to which the local population is invited and where a certificate stating the technical standards of the demining is issued to local authorities. To be effective, confidence-building ought to be a process rather than an event. As the example of Nairoto illustrates above, close relationships between agency and villagers, linked to strong visibility of the operation, fosters feelings of confidence among local populations.

The issue of confidence in cleared areas can serve as a good illustration of the reorientation of definitions of impact. Whereas most organisations would traditionally have been satisfied with earlier minefields being cleared up to existing standards, it is now increasingly realised that the operation has failed its purpose unless areas are trusted and taken into use. The ability of operators to ensure that their projects have an impact at all levels, including at the local level, should not be regarded as unimportant. People need to know that operations are being conducted for their benefit, and they need to see what this benefit is. An operator may be satisfied achieving only the primary goal of the task, such as demining around the water pipeline in the case

of Nacala. However, although this is a major impact in itself, we would argue that there is considerable room for synergies and that operators should feel responsible for maximising their impact at different societal levels.

Countries that go from war to peace-building and reconstruction are often flooded with aid, and people may easily come to expect and depend on assistance. One implication of this is that people, in particular communities, may feel that they are left out. As with many communities hosting demining, people remain uninformed about what the costs are, and may continue to feel bypassed even after massive investments are made in mine action. The solution to this is not to spread a thicker layer of aid over a country, but rather for individual agencies to work close to people, and to demonstrate through practical examples that demining is to their benefit. Basically, organisations need actively to seek synergies when addressing what they perceive as their primary tasks.

One example of lost opportunities to serve the local population may be Capirizanje. Here, it took years before the locals started using cleared land. The rapid growth of vegetation means that people would have saved considerable time in opening up new areas for cultivation had they been able to take the area into use immediately after demining. Similarly, in Nacala locals think that the mined area currently does not host wild animals. The demining personnel knew there was a hunting potential, but because they did not communicate this fact to locals, another opportunity for generating positive local interest was lost.

As in other post-conflict countries, communities in Mozambique do not only need demining, but also a large number of other reconstruction efforts. The Nacala Velha community, where the Nacala minefield lies, does not have a local school beyond second grade, nor a health post. Hence, it is difficult for the local population to accept that they are hosting a large reconstruction effort that has no impact on their daily lives. Again, options for creating synergies have been lost. It is now broadly recognised that populations need to see the benefit of reconstruction efforts taking place; if not they will feel increasingly powerless. More broadly, communities must feel ownership of emergency and development efforts in their area if these efforts are to be sustainable. In the Nacala case, community interest in demining would have been much larger if people had known that the area being freed up would be accessible for them to harvest wood and make coal.

Being able to create synergies depends to a large extent on the local adaptability of the individual organisation. Communities are highly varied entities, with very different needs and capacities. One traditional criticism of demining organisations is that the units they contain are too large, with the result that they become less mobile and are unable to take on smaller tasks. Most organisations have now developed the flexibility to do spot tasks, in itself a major confidence-building measure. However, it seems that at a more general level, there is an inclination to standardise particular measures of adaptability, spot demining being a case in point. In Songo, for instance, people started to occupy areas that were cleared before any official hand-over had taken place. It seems inflexible of the operators not to have been able to hand over sections of the larger minefield at regular intervals.

Impact studies and knowledge building

In current practice, the Level Three Survey is the completion report, written immediately upon finalising the task and constituting the document that is given to stakeholders as a certification of the operation. Whereas such documentation is necessary within a larger process of mine action programming and evaluation, it is written at a time when important elements of the impact cannot yet be established. The only access one has to study the long-term impact of operations is to follow up project areas regularly after project completion. Such follow-up studies should serve as a primary information source for improving operational procedures in general and indicator formulations and impact-assessment techniques in particular. It is recommended that agencies institutionalise regular follow-up of past clearance tasks, and that the knowledge gained thereby is systematically fed back to all organisational personnel, particularly to those who work with the analysis and prioritisation of new tasks.

Building analytical competence

A major difficulty of mine action programmes in Mozambique, as elsewhere, is the failure to realise that socio-economic analysis requires time and competence (Horwood, 2000:13-14). At present such analysis is mainly the responsibility of personnel who do not have basic skills in such matters, at times being tacked on to an array of other operational responsibilities. Although there are some remarkable individuals who, against all odds, do this work well, current arrangements cannot ensure quality assessments. The belief still persists that if only good instruments (i.e., questionnaires, ranking systems, computer packages) can be developed, the work can be done with existing capacities, at least if short-term training is given to key personnel. As should be clear at this stage of this report, data collection based on standardised indicators is just one tool in a larger kit, and on its own is unlikely to bring substantial improvements to mine action programmes. Furthermore, indicator-based systems are only as good as the data that are fed into them, and at present the ability to collect quality data is very limited. Below are two good illustrations of this.

The ongoing CIDC Landmine Impact Survey rests upon the assumption that a survey team can spend a few hours with a group of key informants, fill in a standard questionnaire, and, on this basis, form a qualified, yet coarse-grained, opinion about the socio-economic impact of landmines in that locality. The assumption is problematic for several reasons. For one, it is vital that the best informants are identified. Another difficulty is that group meetings give limited information and are often dominated by one or a few individuals. Group meetings are good for public information purposes; less so for gathering solid data on socio-economic impact. Although there are obviously constraints on the time and personnel that CIDC is able to devote to each task, the data, as it is currently being collected, may not be of acceptable quality.

A different issue is about question formulation in surveys. There is an obvious risk of respondents inflating the impact of mines when researchers come in and announce their interest in the landmine issue. Efforts must be made to counter the risk through attitudes, and through the way questions are put. It is therefore counter-intuitive when existing surveys use questions such as the following (both from surveys conducted in Mozambique):

How many members of this house have been hurt by mines? (Roberts and Williams, 1995:503)
How many persons were killed by mines or unexploded ordnance in the area shown on the map in the past 12 months? (CIDC, 1999:6)

By using question formulations that actively discourage the response that is likely to be most common, namely "none", this sort of questioning is unlikely to generate reliable data.[16]

Building up competence in socio-economic analysis as the primary responsibility of a few individuals within an organisation is not enough. As should be clear from the above, a reorientation needs to be ingrained through the whole organisation. Unless deminers, drivers and paramedics realise that their attitudes to, and interaction with, locals are key to the success of the operation, organisations have a problem. Although such relationships are often good, there is a need to ensure that their importance is understood by building it into training programmes. Likewise, it needs to be ensured that all staff realise the importance of socio-economic impact — without needing to train every staff member as an analyst.

The requirement of dedicating resources to socio-economic impact assessments is rooted in the redefinition of the objectives of demining. The removal of mines has been seen as a self-contained objective, with all attention given to the technicalities of the operation. Clearly, demining is both a demanding and a risky enterprise. Nonetheless, we must not lose sight of the fact that the ultimate objective is making an impact on people's livelihoods. The challenge now is to build the required competence into demining and mine action, without losing sight of the need to uphold and develop technical skills.

Concluding remarks

Mine action in Mozambique has been characterised by many and varied types of actors. There has been a general failure to build viable co-ordinating structures, and even today there does not exist one standardised procedure applied by all operators in the country. For prioritisation and impact assessments, as well as for the more technical aspects of the operation, each organisation has its own procedures.

More generally, mine action operators in Mozambique have operated in tandem with the wider reconstruction effort — with demining being separated out as a technically demanding and highly different task. PRIO argues that mine action practitioners need to work with a focus on the mid- to long-term impact of their work, and that such a change of focus would also be conducive to an increased realisation of the potential that there is for increasing benefits relative to costs through how one builds relationships with host communities.

Socio-economic analysis needs to be strengthened in all phases of the mine action process. It seems to be the case that socio-economic data is only gathered during the Landmine Impact Survey. PRIO, however, suggests that a Impact Survey can only give a rough overview on the basis on which one can select areas for more careful

[16] Leading questions do have their role, particularly in cases where one is relatively certain that people have information on something but might be inclined to respond that they do not, for example because they regard it as unimportant.

investigation. This investigation would serve as the socio-economic complement to the technical information gathered during the Technical Survey, and ought to take place before final priorities are established. Furthermore, it is argued that attention to socio-economic factors, and the building and maintenance of strong community relationships, is vital throughout the whole operation.

One implication is that the current attention to Post-Clearance Surveys is problematic, since this tends to be linked to the assumption that building confidence in cleared areas can be arranged as a singular event upon completion of demining. Building confidence needs to be an objective throughout the whole project cycle. Demining agencies have huge potential for increasing benefit in relation to costs if they invest more in community relationships throughout the operation. It is also argued that the attention to Post-Clearance Surveys is unhelpful in another sense: it veils the fact that the real impact of operations can only be established in hindsight. There is a critical need to follow up with socio-economic data gathering in demined areas at regular intervals; this will help to build knowledge and inform future impact assessments as well as project implementation routines.

Finally, it is suggested that the whole reorientation of mine action to take socio-economic impact seriously requires a thorough upgrading of analytical skills across the sector. Devising new tools to deal with socio-economic issues is not likely to be effective unless backed up by a major investment in capacity-building to collect solid data, draw sensible conclusions from that data, and ensure that this is reflected throughout the demining process.

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The authors of the Mozambique case study would like to dedicate it to Uffe Hansen, NPA's Resident Representative in Mozambique, who was tragically killed in a car accident in Zimbabwe on 12 April 2000. Uffe dedicated considerable time and effort to improving the way demining was conducted.

Appendix 4

Role and responsibilities of the Study Core Group

Responsibilities of the Core Group

1. The Study Core Group is to provide overall direction to the study, and in particular the project manager.

2. The Study Core Group's responsibilities are to:
   a. Submit comments on the study background paper;
   b. Attend the first roundtable workshop and contribute to the study outline and framework;
   c. Comment and provide input on the first draft of the study;
   d. Attend the second roundtable workshop and contribute to the finalisation of the study.

Composition

3. The Study Core Group should comprise representatives from the social science field, experienced mine action practitioners, academia, the World Bank, United Nations, and the Geneva International Centre for Humanitarian Demining.

Meetings

4. It is envisaged that the Study Core Group will meet formally twice at the roundtable workshops; other briefings will be given and decisions will be taken using electronic mail.

Appendix 5

Study Core Group Members

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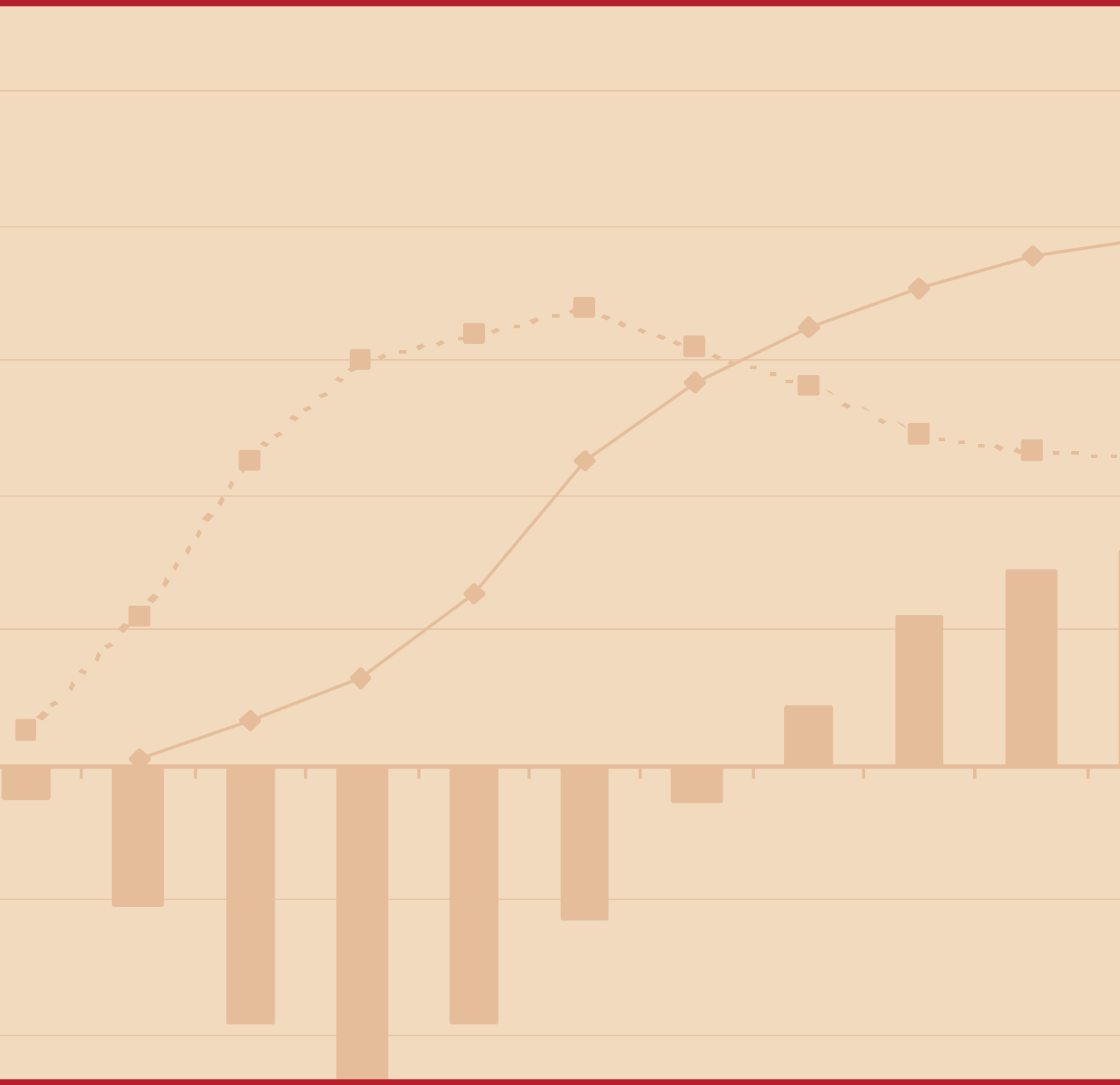
Glossary of acronyms

ADP	Accelerated Demining Programme, Mozambique
AMAC	Assistance to Mine-Affected Communities Project
ASEAN	Association of South-East Asian Nations
BAC	Battlefield area clearance
CBU	Cluster bomb unit
CIDC	Canadian International Demining Centre
COPE	Co-operative Orthotic and Prosthetic Enterprise
DHA	UN Department of Humanitarian Affairs (now OCHA)
EOD	Explosive ordnance disposal
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRELIMO	Mozambique Liberation Front (Frente de Libertação de Moçambique)
GDP	Gross Domestic Product
GICHD	Geneva International Centre for Humanitarian Demining
GIS	Geographic Information System
GNP	Gross National Product
GPS	Global Positioning System
GTZ	German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit)
HI	Handicap International
ICRC	International Committee of the Red Cross
ICVA	International Council of Voluntary Agencies
IDRC	International Development Research Centre
IMADSC	Integrated Mine Action Development Strategy
IMAS	International Mine Action Standards
IMSMA	Information Management System for Mine Action
IND	National Demining Institute (Instituto Nacional de Desminagem), Mozambique
IOM	International Organization for Migration
IRR	Internal Rate of Return
KFOR	Kosovo Protection Force
KLA	Kosovo Liberation Army

Lao PDR	Lao People's Democratic Republic
LFA	Logical Framework Analysis
LPRP	Lao People's Revolutionary Party
MAC	Mine Action Centre
MACC	Mine Action Co-ordination Centre
MAG	Mines Advisory Group
MAP	Ministry of Agriculture, Mozambique
MLSW	Ministry of Labour and Social Welfare, Lao PDR
MoPH	Ministry of Public Health, Lao PDR
MPL	Marginal Product of Labour
MSU	Michigan State University
NATO	North Atlantic Treaty Organization
NGO	Non-governmental Organisation
NPA	Norwegian People's Aid
NPV	Net Present Value
OCHA	Office for the Coordination of Humanitarian Affairs
OECD	Organisation for Economic Cooperation and Development
PPP	Purchasing Power Parity
PRIO	International Peace Research Institute, Oslo
PV	Present Value
RENAMO	Mozambique National Resistance (Resistência Nacional Moçambicana)
SAC	Survey Action Center
SC	Steering Committees (Lao PDR)
SOP	Standing Operating Procedure
SWAP	Sector Wide Approach to Programming
UK	United Kingdom
UNDP	United Nations Development Programme
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNMAS	United Nations Mine Action Service
UNMIK	United Nations Mission in Kosovo
UNOHAC	United Nations Office for the Co-ordination of Humanitarian Assistance, Mozambique
UNOMOZ	United Nations Operation in Mozambique
US	United States of America
UXO	Unexploded ordnance
UXO LAO	Lao National UXO Programme
VVAF	Vietnam Veterans of America Foundation
WFP	World Food Programme
WHO	World Health Organization



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