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]

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[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.

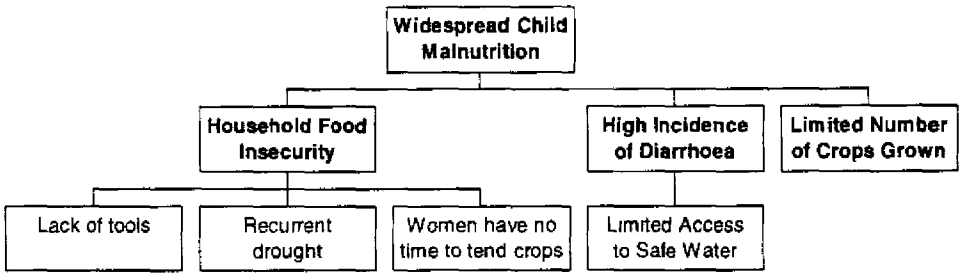
7. Reliable: Can data of sufficiently reliable quality for confident decision-making be obtained? The data that a programme manager needs to make reasonably confident decisions is not necessarily the same standard a social scientist requires. For example, a low cost mini-survey may be good enough.

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

An illustration of setting objectives

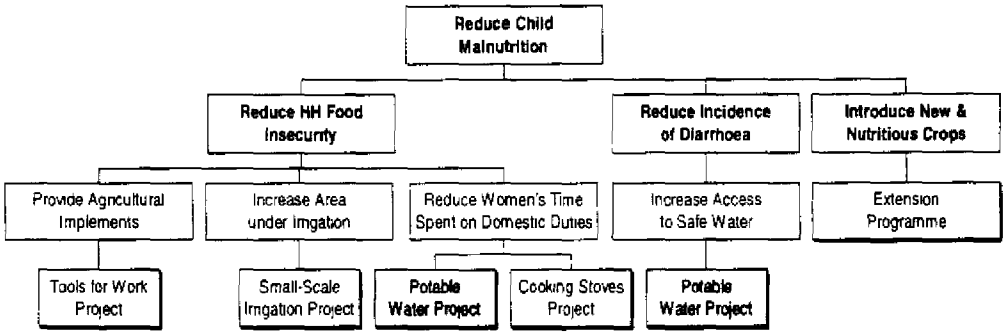
One of the International Development Goals adopted by OECD's Development Assistance Committee, the World Bank, and UNDP is "Reducing infant and child mortality", with a target of a two-thirds reduction from the 1990 level of infant mortality by 2015. An African country wishes to achieve this goal, and 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] Thus 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***

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[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.*

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.† 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"

* 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.

† 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.

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[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