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Introduction

Growing out of the wide collaborative efforts of the International Treaty to Ban Landmines, Landmine Impact Surveys are executed to meet the overlapping needs of international donors, national authorities in mine-impacted countries, and mine action planners.

The overall vision for Landmine Impact Surveys as articulated by the Survey Contact Group, is to *"facilitate the prioritizing of human, material and financial resources supporting humanitarian mine action at the national, regional, and global level."* Subsequent meetings of the Survey Working Group further refined this vision into a number of subordinate objectives focused upon three key constituencies.

- Allow *donors* to rationally apportion funds to places of greatest human need as defined by impact on communities.
- Permit *national authorities* to develop national plans focusing on regions and areas of greatest impact.
- Give *implementers* baseline impact data that will provide success indicators for mine action programs.

In sum, this implies nothing short of a major revision of how mine action programs are managed and how resources for such programs are allocated. Impact surveys are a first and vital step in the overall enhancement of humanitarian mine action and dramatically improve the quality of information available to senior decision makers.

The findings and information presented in this report and stored on the Information Management System for Mine Action (IMSMA) are intended to be descriptive in nature, providing the best and most comprehensive data possible regarding the impact that landmines and Unexploded Ordnance (UXO) have upon the people of Yemen. While essential for sound national planning, this report is *not* a substitute for a national plan. It does not relieve the national authorities or mine action centers from their collective responsibility to gain a full understanding of the results of the survey, set priorities, mobilize funding, and allocate resources in a rational and effective manner. Likewise, the data presented are valid as of the completion of the survey; a continued commitment to sound information use and updating is required to extract long-term value from this work.

As a global initiative with a stated goal of standardizing information across countries, Landmine Impact Surveys make a concentrated effort to ensure conformity of methods, procedures and processes. These are based upon best practices in the fields of social science research and mine action, and are supported by both internal and external quality control mechanisms. All surveys executed with the involvement of the Survey Action Center measure and score impacts in affected communities in a generally uniform manner. This being stated, the true value and nature of impacts cannot be ascertained by a quick tallying of colored dots on a map; instead readers should make a concentrated effort to understand all aspects of the problem as presented in this report.

Executive Summary

SUMMARY OF CONCLUSIONS

The Landmine Impact Survey conducted in the Republic of Yemen from July 1999 to July 2000 conclusively identified 592 mine-impacted communities and 1,078 contaminated areas. The survey covered at least 95 percent of the suspected mine-impacted communities in the country with a high degree of confidence.

While the data collected during this effort affords extensive opportunities for research and analysis, four key points are most salient:

- First, *water is critical* to the health and well-being of the communities in Yemen, and when mines block access to water, the negative impacts upon local communities can be profound. Special attention should be given to those communities where water access is blocked.
- Second, *impacts are clustered* in groups of communities creating broad swaths of contamination and suggesting that well-targeted mine action programs can quickly reach a large number of affected communities.
- Third, *community size does not matter* much in the final scoring analysis and that small communities should not be ignored.
- Fourth, accident profiles indicate that *mine awareness education programs should target* persons engaged in *livestock grazing*, particularly women and risk-taking behaviors among teenage boys and young men.

With the completion of this survey, Yemen now has at its disposal the most comprehensive set of mine-related socio-economic impact data in the world. These data will allow Yemen to develop effective national plans that target areas posing the greatest threat and communities bearing the greatest impact. *With focused effort and sustained funding, the impact of landmines in Yemen can be dramatically reduced and controlled.*

PROJECT OVERVIEW

A Landmine Impact Survey was conducted in the Republic of Yemen starting in July 1999 with fieldwork, and data collection finished one year later in July 2000. This survey was requested by the United Nations Mine Action Service (UNMAS) on behalf of the Yemen National Demining Committee (NDC), which is chaired by the Minister of State for Cabinet Affairs. The Survey Action Center (SAC) implemented the survey in conjunction with the Afghan-based Mine Clearance Planning Agency (MCPA) in accordance with the guidelines and protocols set forth by the Survey Working Group (SWG). Funding for the survey was provided by the governments of Canada, the United States, Germany, and Japan, and included partial matching by the United Nations Foundation. The survey was made possible through a contracting mechanism and with the support of in-country U.N. staff provided by the United Nations Office for Project Services (UNOPS).

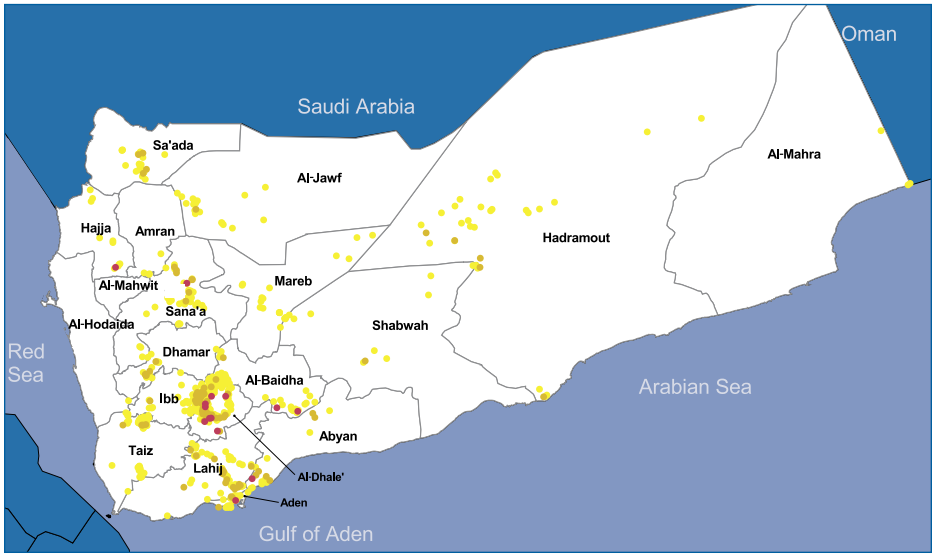
COST

Conducting the survey in Yemen cost a total of $1,650,000. Of this amount, $450,000 consisted of nonexpendable equipment such as vehicles transferred to the NDC as part of a plan to expand national mine action capacity.

SCOPE OF PROBLEM

The 592 landmine-impacted communities indicated by the survey are distributed in 18 governorates, primarily in the south and central portions of Yemen (see Map 1). There are an estimated 828,000 Yemeni civilians, roughly 6 percent of the total population, living in these communities. This means that at least one in every 16 Yemenis lives or works near or is otherwise affected by the presence of landmines. One thousand seventy-eight distinct mined areas were located with a total reported surface area of 923 million square meters.

Results indicated a tendency for mine-affected communities to be grouped together into "clusters" of contamination. Two large clusters dominate the dispersal pattern of affected communities, concentrating the adverse impacts of mines in an area straddling six governorates. Additionally, there are several smaller clusters as well as a residual set of communities widely dispersed across the country.



MAP 1

DISTRIBUTION OF MINE-AFFECTED COMMUNITIES

Village priority
- High
- Medium
- Low

IMPACT UPON COMMUNITIES

A scoring mechanism rank orders communities in terms of the degree of mine impact. Indicators considered include the number of victims within the past 24 months, blocked access to facilities or livelihood areas and the type of contamination. Based upon this system, 14 communities are considered to be highly impacted, 84 moderately impacted, and 494 lightly impacted. The most significant difference

between a "high impact" and a "moderate impact" community is the reporting of a mine incident within the last two years. The number of people living in these communities are as follows: 36,472 in highly impacted communities, 178,763 in moderately impacted communities, and 612,559 in low-impacted communities.

TABLE 1

COMMUNITIES REPORTING BLOCKED ACCESS

Areas of blocked access	Communities affected
Pasture	529
Rain-fed farms	148
Local roads and trails	128
Wood foraging	103
Water, other purposes, including irrigation	54
Drinking water	45
Irrigated farms	34
Roads to administrative centers	27
Housing	24
ALL AFFECTED COMMUNITIES	**592**

IMPACT UPON SECTORS

The survey collected extensive information regarding the types of livelihood activities and institutions that are denied to local populations through the presence of landmines and UXO. As indicated in Table 1, the most frequently reported impact of mines is blocked grazing land, with 89 percent of all communities reporting this loss. The impact most closely associated with mine accidents and often perceived as the most detrimental in the minds of the villagers is loss of access to a source of water, either for drinking or irrigation.

The survey indicates that there have been at least 178 mine victims in the last two years, 136 males and 42 females. The largest concentration of incidents was experienced by persons of both genders engaged in livestock herding (60 cases), followed by young males who were tampering with mines or UXO (40 cases).

CAUSALITY

Statistical analysis confirms a number of factors associated with increased mine risks. These include the pressure on existing resources and the need to range far afield to find water, land, etc.; the intensity of the past conflict; and the level of institutional capacity within a given communities. Moreover, high-risk communities tend to cluster in space, increasing the risks faced by the inhabitants in all the communities found in such a cluster.

CONCLUSION

The results of the survey clearly indicate that the Republic of Yemen suffers many adverse consequences from landmine and UXO contamination. The collected information will allow for the creation of a well-planned and targeted set of mine action initiatives. Given sustained funding support, these initiatives will allow Yemen to free itself from the most adverse consequences of landmines. Economic opportunity and enhanced safety can quickly be restored to those communities that are suffering the most, with longer-term efforts aimed at concentrating resources where they will have the greatest benefit.

The impact survey provides Yemen with the information that it needs to put in place a program that one day, in the not too distant future, will make it a country free from the fear of landmines.

ACRONYMS USED IN THIS REPORT

AP	Anti-Personnel Landmine(s)
AT	Anti-Tank Landmine(s)
CBU	Cluster Bomb Unit
CD	Compact Disk
CMA	Community Mine Awareness
Direct MA	Direct Presentation Mine Awareness
DTED	Digital Terrain and Elevation Data
EDD	Explosive-Detecting Dogs
EOD	Explosive Ordnance Disposal
GICHD	Geneva International Center for Humanitarian Demining
GIS	Geographic Information Systems
GLS	Global Landmine Survey
ICRC	International Committee of the Red Cross
IMSMA	Information Management System for Mine Action
LIS	Landmine Impact Survey, formerly Level One Impact Survey
LQAS	Lot Quality Assurance Sampling
MCPA	Mine Clearance Planning Agency
NDC	National Demining Committee
NGO	Nongovernmental Organization
NTEU	National Technical Executing Unit
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
QAM	Quality Assurance Monitor
SAC	Survey Action Center
SWG	Survey Working Group
UNDP	United Nations Development Program
UNFIP	United Nations Fund for International Partnerships
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNMAS	United Nations Mine Action Service
UNOPS	United Nations Office for Project Services
UXO	Unexploded Ordnance
VVAF	Vietnam Veterans of America Foundation
WFP	World Food Programme
WHO	World Health Organization

MAPS, TABLES, AND FIGURES

Maps

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Figures

Survey Results & Findings

Survey Results & Findings

Scope of the Problem

NUMBER OF COMMUNITIES AFFECTED

The survey identified 18 mine-affected governorates out of the 19 governorates in Yemen. In total, 592 communities in 95 districts were found to have a landmine and/or UXO problem. An estimated 828,000 people are living in those affected communities.

Table 2 shows the distribution of affected districts, communities, and populations for the 18 affected governorates. There are large differences in the number of mine-affected communities among governorates. At the low end, Al-Hodaida governorate has only one affected community. At the high end, the central governorate of Ibb has 95 affected communities.

The 95 mine-affected districts contrast with the 191 districts that are reportedly mine-free. The 1994 national census reported a combined population of 4,512,525 for the affected districts, and of 9,077,433 for the mine-free ones. It can be estimated that roughly one in every three citizens is living in a mine-affected district.

TABLE 2

AFFECTED DISTRICTS, COMMUNITIES, AND POPULATIONS, BY GOVERNORATES

Governorate	Districts	Communities	Population affected
Abyan	3	19	31,552
Aden	5	20	49,690
Al-Baidha	7	54	125,113
Al-Dhale'	7	81	118,981
Al-Hodaida	1	1	700
Al-Jawf	6	20	15,960
Al-Mahra	2	3	911
Amran	3	6	47,550
Dhamar	2	16	3,890
Hadramout	8	32	32,552
Hajja	6	11	10,455
Ibb	10	95	73,922
Lahij	6	52	104,158
Mareb	4	23	20,437
Sa'ada	4	23	27,545
Sana'a	9	47	109,540
Shabwah	6	9	8,030
Taiz	6	80	46,808
TOTAL	**95**	**592**	**827,794**

SETTLEMENT TYPE AND POPULATION SIZE

Mines and UXO in Yemen primarily affect village communities. Table 3 shows that 521 out of 592 affected communities are villages as opposed to urban or nomadic communities. However, populations are larger in urban settlements; thus, urban and suburban communities account for a quarter of the mine-affected population. Few nomadic communities were surveyed. This may be due to the fact that nomads traditionally do not inhabit the heavily mine-polluted areas of north and central Yemen.

TABLE 3

AFFECTED COMMUNITIES AND POPULATIONS, BY SETTLEMENT TYPE

Settlement type	Affected communities	Population	Mean population
Urban	10	93,640	9,364
Suburban	24	113,960	4,748
Compact village	230	323,216	1,405
Dispersed village	283	284,753	1,006
Seasonal village	8	737	92
Nomadic	32	10,932	342
Other*	5	556	111
TOTAL	**592**	**827,794**	

*E.g., an ocean fisherman's staging post, a former police station, a bus stop with stores, most of them in Aden and Abyan near or on the coast. Further note: The Aden Free Trade Zone, which is currently being demined, is recorded in this database as the three communities of Abo Harbah, Al-Heswa, and Al-Wahda Assakaniyah.

The majority of affected communities were small. Three-quarters had estimated populations of 1,500 or less; half counted 500 inhabitants or fewer. Among the affected villages, population size spanned nearly four magnitudes, with the smallest reporting a mere six people and the largest reporting a population of 40,000—the city of Raydah in Amran governorate.

FIGURE 1

POPULATION SIZE DISTRIBUTION, COMMUNITY-LEVEL

(Communities > 5,000 excluded)

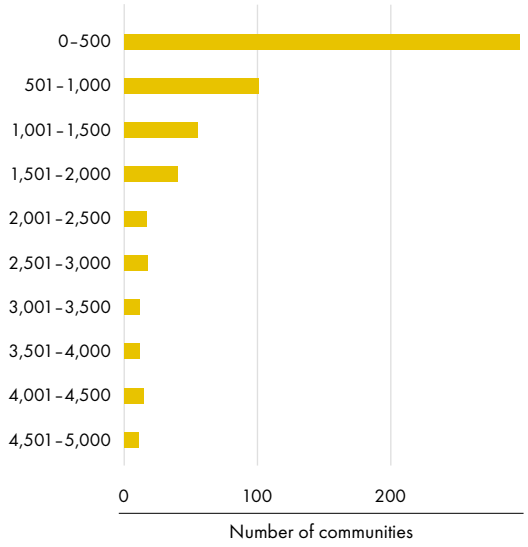


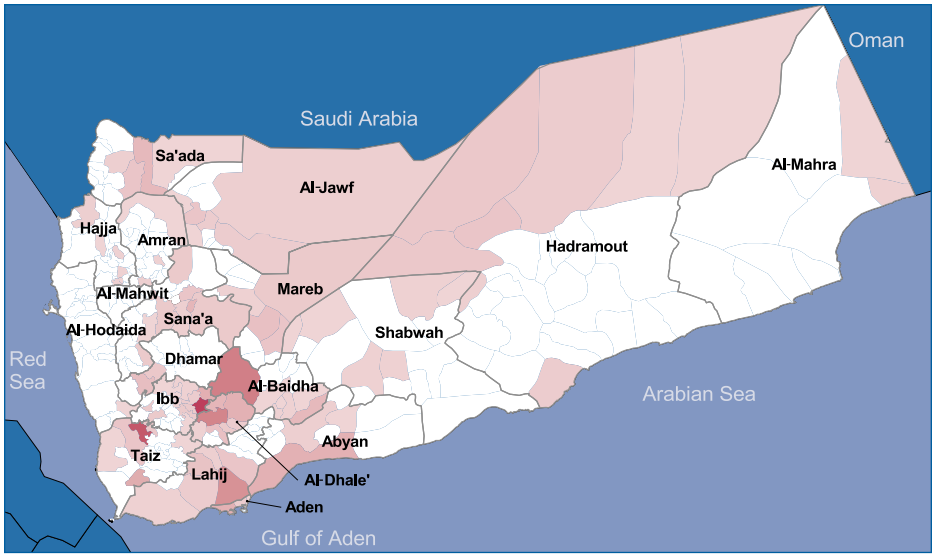
Figure 1 shows that many more affected communities have small populations than large populations. This is in keeping with the distribution of population size; in general there are many more small communities than large communities in Yemen. Although not all parameters of the distribution of all communities in Yemen are known,[1] there is no indication that the affected ones follow an atypical population size pattern. This is true with the exception of very large cities, none of which was found to be mine-polluted. These results attest to the lack of bias in the survey against small communities.

[1] The 1994 census registered a total of 38,310 communities and a total population of 13,589,958, or a mean community population size of 355. This is substantially smaller than the population mean of the affected communities, which was estimated to be 1,401. Since the census definitions are not known, a comparison at this level is not feasible. The difference may be due to the treatment of dispersed village communities, which are abundant in parts of the country.

GEOGRAPHIC DISTRIBUTION OF IMPACTED COMMUNITIES

The vast majority of affected communities are in the western half of Yemen, and in the northern, central and southern portions of this half. Only a small number were found in the eastern governorates. Map 2 shows the distribution of affected communities by district.

Clearly, several clusters of affected communities are visible. They correspond largely, if not completely, to the history of armed conflicts in Yemen. Communities where mines were last planted in the '60s are for the most part in the north. The mines planted in the '80s are concentrated in the central region of the country. During the war of 1994, mines were used in the southern governorates and in some communities in the east. Map 3 shows the distribution of impacted communities by conflict period.

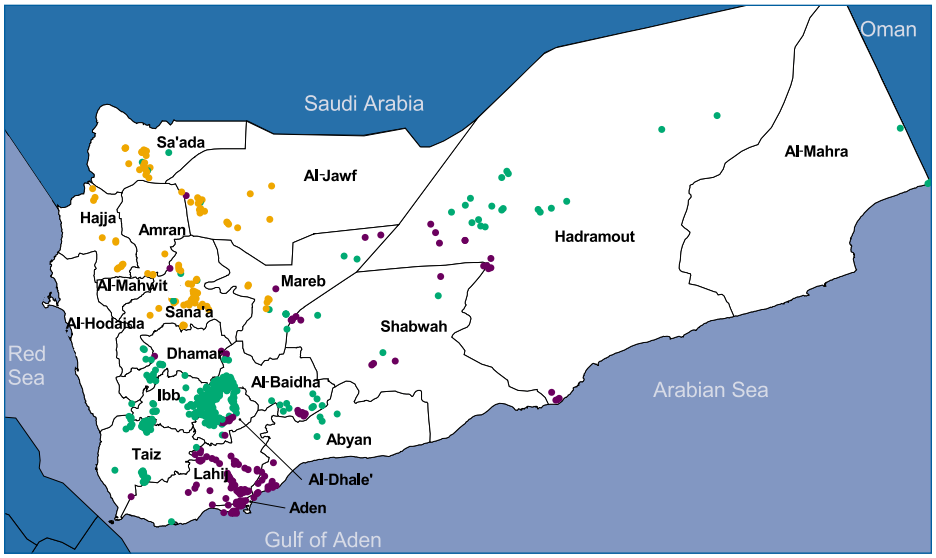


MAP 2

IMPACTED COMMUNITIES BY DISTRICT

Number of impacted communities

1 28 55



MAP 3

IMPACTED COMMUNITIES BY AGE OF CONFLICT

Year mines last laid

- 1962-1969
- 1970-1993
- 1994

MINED AREAS

The survey identified 1,078 distinct areas suspected of landmine and/or UXO contamination. Key informants in the affected communities estimated that the suspected areas cover a total land surface of up to 923 square kilometers.

FIGURE 2

MAGNITUDES OF MINED AREA SURFACES

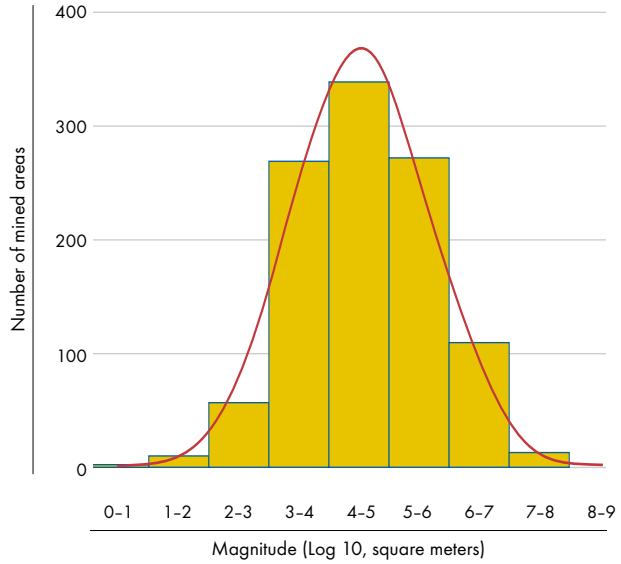


TABLE 4

COMMUNITIES, BY DISTINCT MINED AREA

Distinct mined areas in the community	Number of such communities
1	317
2	154
3	68
4	36
5	10
6	3
7	1
8	2
14	1
TOTAL	**592**

The individual mined areas differ greatly in their relative size. While population size among affected communities ranges between numbers that span nearly four magnitudes, the size of affected land areas spans more than seven magnitudes, from four square meters to 81 square kilometers. Grouping the number of mined areas by the magnitude of their surface area yields a normal distribution pattern.[2]

Half of the suspected area estimates are between 5,000 and 240,000 square meters. A quarter of them are smaller than 5,000 square meters; another quarter are larger than 240,000 square meters. Ten percent are larger than 1.2 square kilometers (1.2 million square meters).

The median size of an affected area is 36.75 square kilometers or, more graphically, a square with sides 192 meters long.

MCPA has reason to believe that a considerable number of the surface estimates are exaggerated. In such cases, only a technical survey will produce more accurate estimates. Nevertheless, a community's estimate of affected surface area tends to indicate the magnitude of experienced problems arising from landmines. Estimates of surface area also tend to be correlated with the probability of mine accidents as well as the clearance challenge.

The number of distinct mined areas reported per community also varies. This may be due to the actual locations

[2] The 1st-10th decile range is of magnitude 3.0 for mined areas. It is 1.5 for population size.

of the mines as well as to the perceived danger by community members. If a mined area is not perceived to be dangerous, perhaps because it is familiar to the community and easily avoided, then community members may fail to report its existence. Thus, it is possible that the number of distinct mined areas has been underreported. Alternatively, more than one community may have claimed a given mined area. While this does not affect the calculation of impact scores, it may have inflated the estimated total mine-affected surface area. It is with these precautions that the following breakdown of communities by number of locally mined areas is to be understood.

As Table 4 shows, on the previous page, few communities reported more than four distinct areas; one community reported 14 distinct mined areas.

VICTIMS OF MINE ACCIDENTS

Among the 592 communities surveyed, 488 had a history of mine accidents injuring one or more persons. Among these communities, 78 recalled victims in recent times. In most of the interviews, "recent" was defined as meaning "in the past 24 months." There were 474 communities that reported victims from periods before the past 24 months. Table 5 summarizes the relevant figures.

TABLE 5

MINE VICTIM SURVEY

Period	Communities involved	Victims		
		Killed	Injured	All
Recent victims	78	57	121	178
Victims of less recent date	474	2,503	2,223	4,726
All victims*	488	2,560	2,344	4,904
Had no victims	104	–	–	–

*The set of communities with some victims, regardless of the date of accidents, is the union of the two period sets, not a simple addition. Some communities had victims in both periods. The victims, however, are mutually exclusive; their numbers add up.

More information was elicited about recent victims than about victims prior to the past 24 months, in part for reasons of interviewee recall. The figures concerning older victims are at best approximate, while those regarding recent victims appear reliable. Based on these figures, the estimate of mine accident victims per 100,000 people per year seems defensible. The following rates are calculated from the 1994 census:

- Based upon the population in the affected communities 10.75
- Based upon the population of the affected districts 1.97
- Based upon the national population 0.65

Factoring in population growth since 1994 will lower these rates somewhat, placing the national estimate for Yemen in the neighborhood of 0.5 victims per 100,000 people per year.

Impact on Communities

THE SEVERITY OF IMPACTS

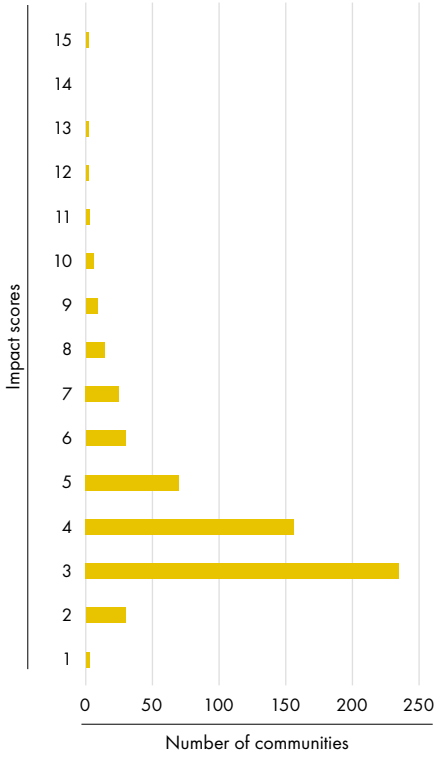
For each affected community, the survey calculated a point score expressing the severity of the various mine impacts. The score takes three major impact factors into account:

- The number of recent victims
- The livelihood and institutional areas to which mines block access
- Class of munitions

FIGURE 3

DISTRIBUTION OF IMPACT SCORES

(values > 16 excluded)



The score is then used to classify communities as low, medium or high impact. Scores range from one to 46. As reflected in Figure 3, a score of one indicates that a community reported only the presence of some UXO and no serious blockages or recent victims. The survey found only three communities with this very mild signature. At the other end of the scale, a score of 46 was assigned to the communities of Al-Madmanah and Al-Qhazari, in the Mukairas district of Al-Baidha governorate. Children from these two neighboring communities were playing with an artillery shell. The explosion injured 22 of them.

However, most communities (83 percent) had a score of five or less. The modal score—the score most often given—was three (45 percent of all communities). The median score was four, meaning that half of the communities scored four or less. The arithmetic mean was 4.38.

In the methodological appendix, it will be shown that the shape of the distribution, heavily skewed to the low values, is not a consequence of the scoring method only. A similarly skewed distribution applies to the probabilities of mine accidents estimated on entirely different bases.

The score ranges that qualify an affected community as being classified as low, medium, or high impact are shown in Table 6.

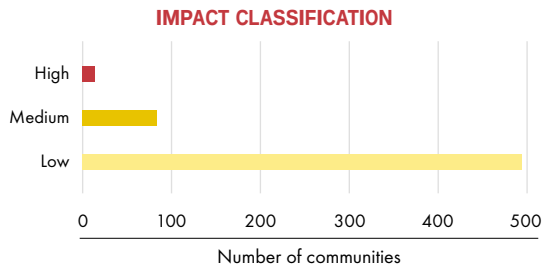
TABLE 6

IMPACT SCORE CLASSIFICATION

Score range	Classification
1–5	Low
6–10	Medium
11 and higher	High

With this classification, 494, or 83 percent, of the 592 affected communities are low-impact communities; 84, or 14 percent, are medium-impact; 14, or 2 percent are high-impact. Figure 4 portrays the distribution of low-, medium-, and high-impact communities.

FIGURE 4



Scoring the forgotten communities

Qaroodh, in Al-Dhale' district of Al-Dhale' governorate, was initially classified as highly impacted, based upon information from the enumerators. In June 2000 an independent team revisited the locality for a detailed case study, and to verify the initial information.

Straddling the former border between South and North Yemen, Qaroodh stood in the middle of the internal wars of the '80s and '90s. Landmines menace those who venture to the north and west of the village center. Three contaminated areas, which together would fill a square 800 by 800 meters, occupy valuable farm and pasture land and isolate residents from water sources and other villages.

The people of Qaroodh vividly recall the day in 1980 when their first neighbor was killed by a landmine. Mr. S., a farmer, was working in his field when the villagers heard an explosion. Later, they drove a bull into the suspected area. The bull never returned. The injury and death of animals in mined pastures constitutes a significant loss for these poor farmers, further compounding the human suffering caused by mines. A farmer woman, Mrs. H., remembers:

> On the second day of the 1994 war, I took my 40 goats and two cows for grazing to the other side of the valley. I was with my son, who was 11 years old then. The goats spread. While we were watching them, I saw a donkey tied to a tree. I felt sorry for him and decided to untie him. After a few steps, I heard an explosion. I was up in the air. I did not lose consciousness. I knew it was a mine; I had seen several mine accidents in the village. Later, I was taken to a hospital in Aden. After a month, I came home without my left leg, and with only half of my left arm. Mines killed also many of my goats and cows.

Once, an army engineer visited the village. He returned with a few men, and they removed 12 anti-personnel mines. Nothing has since happened in the way of mine clearance or development assistance. One of the elders called Qaroodh a community of "the forgotten." Another man expressed a common feeling in the face of the persistent landmine threat: "We are under siege."

(continued on next page)

The case study team concurred with the local perception that this was a community with a resource base severely limited by landmines. Poor and with a population of only 350, the community has so far been unable to attract either effective mine clearance or modern facilities. Children, if they do study, walk to schools three to 15 km away. Electricity is nonexistent.

However, the team also found that their enumerator colleagues had misclassified one of the mine victims as a recent victim. He had been injured more than two years prior, the cut-off point for the definition of recent victims.

The discovery cost Qaroodh two impact score points and its classification as a high-impact community in the survey database. This reevaluation seems to fly in the face of both common sense and moral sentiment. Will its "medium-impact" status make sure that Qaroodh will go on to be forgotten?

Much depends on the circumspection of mine action planners. If they look up Qaroodh on the impact classification map with its bright red, yellow, and green dots, they will notice Al-Masharish, its immediate neighbor to the southeast. Al-Masharish blinks as a red dot. It was classified high-impact because of, among other things, a higher number of recent victims. This is not permanent. Nobody knows whether, in the next two years, Qaroodh will be unlucky enough to return to a higher rhythm of accidents, or whether other villages like Al-Masharish will have fewer.

Breaking the siege of Qaroodh, therefore, starts with the mentality of mine action planners. The survey tools allow them to see the larger picture, including clusters of "communities of the forgotten." Mine action needs to keep *them* in sight as the ultimate purpose of all scoring and classification, in this survey as well as later on.

POPULATIONS BY IMPACT CATEGORY

It is estimated that 828,000 people live in mine-affected communities in Yemen. However, only approximately 36,000 people are believed to be living in high-impact communities, and an estimated 118,000 live in medium-impact communities. The majority live in communities that the survey rated as low-impact. Table 7 summarizes the information again.

TABLE 7

COMMUNITIES AND POPULATIONS, BY IMPACT CATEGORIES

Impact category	Communities	Affected population
Low	494	674,399
Medium	84	117,503
High	14	35,892
TOTAL	**592**	**827,794**

DEMOGRAPHY OF RECENT VICTIMS

There are a total of 178 recent victims. Three-quarters of the victims are male. Among male and female victims both, the age groups most affected are the 5- to 29-year-olds. Figure 5 indicates recent victims by age, while Table 8 shows the gender of these victims. This may be due to the larger ranging movements of children and young adults. However, it may also be due to the fact that there are more young people in the general population than older people. After age 44, females reach victim parity with males.

Table 9 offers a breakdown of recent victims by sex, military/civilian status, and civilian occupation prior to the accident. The primary finding is that 176 out of those 178 victims were civilians.

Among the civilians, 104 of the victims were farmers or shepherds. The survey did not report specific information on those whom it classified as "others," but it may be assumed that most of them were small children or students.

FIGURE 5

RECENT VICTIMS, BY AGE

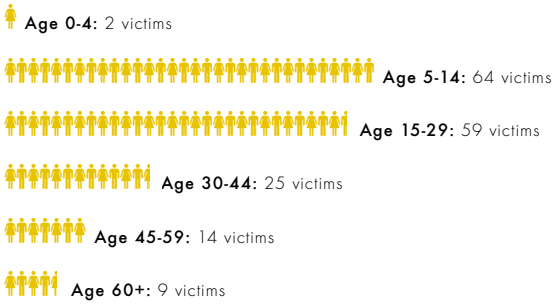


TABLE 8

RECENT VICTIMS BY AGE AND GENDER

Age ranges	Male	Female	Total
0-4	0	2	2
5-14	48	16	64
15-29	49	10	59
30-44	27	3	30
45-59	7	7	14
60 and above	5	4	9
TOTAL	**136**	**42**	**178**

TABLE 9

RECENT VICTIMS, BY SEX, MILITARY/CIVILIAN STATUS, AND CIVILIAN OCCUPATION

Occupation before the mine accident	Male	Female	Total
Military	2	0	2
Civilian			
Farming	20	2	22
Herding	65	17	82
Household work	1	11	12
Trading	2	0	2
Was not earning	2	0	2
Other	43	11	54
Unknown	1	1	2
TOTAL	**136**	**42**	**178**

TABLE 10

ACTIVITY AT TIME OF ACCIDENT

Activity	Male	Female	Total
Military	2	0	2
Civilian			
Collecting Food/Water	5	5	10
Farming	15	3	18
Herding	51	15	66
Household Work	0	5	5
Playing	5	1	6
Tampering	40	11	51
Travel	3	0	3
Other	15	2	17
TOTAL	**136**	**42**	**178**

ACCIDENTS AND CONSEQUENCES

Given that the most frequent victims are farmers and herders, it is not surprising that farming and herding are frequent activities engaged in at the time of the accident. Tampering with mines is another frequent activity occurring at the time of an accident, accounting for more than a third of the victims and ranking as the second most frequent activity for males and females. These and other activities are presented in Table 10. Many affected communities make some local effort at mine clearance.

Of 178 recent victims, 57 died. The fatality rate is higher for females (43 percent) than for males (29 percent), as reflected in Table 11.

An outsider's accident lights a warning beacon

The survey format links recent victims to the mined areas where they came to harm. The normal assumption is that the victims were members of the local community. However, it is not rare to find strangers and travelers to the community straying into mined areas. Some of these accidents may in fact be the first signs that help the locals understand that a particular tract of their territory is not safe.

This is what happened in the community of Sirfah, in Bani Bahlool district in Sana'a governorate. People there were well aware of the presence of mines that were laid in the '60s when Egyptian army units were pitted against royalist forces. However, public concern was chiefly about the anti-personnel mines with which the Egyptians defended their mountaintop positions. The locations of these minefields were known because they killed dozens of livestock grazed on those slopes.

An entirely new situation arose when a man from neighboring Dadah village saw his camel blown to pieces when it triggered an anti-tank mine hidden on the main road. Miraculously, the man walked away unharmed. The community heeded the warning. For years, people did not use the main road.

The blocked road caused serious repercussions. Vehicles could not move in or out. Farmers were barred from sending perishable produce to urban markets. The once famous grape production declined. The extension to Sirfah of schools and electricity was delayed by many years.

(continued on next page)

Recently, the government built a new road parallel to the mined one. Development followed suit. The community was soon connected to the power grid. The prices of imported building material and consumer goods dropped considerably. Television has arrived.

For some, the joy surrounding the new amenities was marred by a freak accident. A young man was laying wire across his attic in order to allow access to the new network. He tossed some old items that were in his way to his 12-year-old sister downstairs. One of them was a small mine. It exploded, injuring the girl in her leg and eye. The shrapnel that is still in her left leg may not yet be the closure to the mine saga for the Sirfah community.

TABLE 11

MINE ACCIDENT AND FATALITIES BY GENDER

Accident fatal	Male	Female	Total
No	97	24	121
Yes	39	18	57
TOTAL	**136**	**42**	**178**
Fatality rate	*29%*	*43%*	*32%*

Table 12 highlights the fact that, of those not immediately killed, four-fifths received some form of emergency care.

The second finding from this table is that physical rehabilitation and vocational therapy for mine accident survivors are rare or absent.

As a result of their wounds and of the level of care available, 57 of the 121 survivors suffered amputations of extremities, 14 lost their eyesight, and 66 sustained other kinds of injuries.

The occupational and health status of the survivors is given in Table 13.

According to these figures, a quarter of the survivors are disabled from their accident. However, these data conflict with other data and are not considered very reliable.

TABLE 12

TYPE OF CARE RECEIVED BY THOSE NOT IMMEDIATELY KILLED

Type of care	Male	Female	Total
Emergency care	80	23	103
Rehabilitation care	4	0	4
Vocational therapy	0	0	0
Other care	14	2	16
No care	0	1	1
TOTAL	**98**	**26**	**124**

TABLE 13

MINE ACCIDENT SURVIVORS, BY SEX AND OCCUPATION

Occupations of survivors	Male	Female	Total
Military	2	0	2
Civilian			
Farming	10	0	10
Herding	18	2	20
Household work	0	3	3
Labor	1	1	2
Trading	1	0	1
Not earning, as before	8	0	8
Student	32	7	39
Small child	2	0	2
Handicapped	22	7	29
Still in hospital	0	4	4
Unknown	1	0	1
TOTAL	**97**	**24**	**121**

Analysis of Blockage Impacts

TYPES OF BLOCKAGES

Key informants in the affected communities pointed to four major areas to which landmines and UXO were blocking access:

- Pasture, farmland, and forest
- Roads and trails
- Water
- Housing

The survey refined those categories by presumed value of the resource area in question. For example, water sources that supplied drinking water were distinguished from other-purpose sources. Rain-fed farms and irrigated farms were considered separately.

Table 14 ranks resource types by the percentage of communities that reported blocked access to them.

TABLE 14

PERCENTAGES OF COMMUNITIES REPORTING BLOCKED ACCESS

Areas of blocked access	Communities affected
Pasture	89%
Rain-fed farms	25%
Local roads and trails	22%
Wood foraging	17%
Water, other purposes, including irrigation	9%
Drinking water	8%
Irrigated farms	6%
Roads to administrative centers	5%
Housing	4%
Other infrastructure	0%

Note: Percentages are based upon a total of 592 mine-affected communities. They do not add up to 100 percent because a given community may see its access blocked to more than one resource or institutional area.

Several findings stand out.

- Pastureland is the most frequently reported mine-impacted resource type. In part, this is due to the nature of armed conflict prompting combatants to mine areas around strategic hillsides and mountaintops that were barren land used for grazing animals only. In addition, this finding is a survey artifact, in the sense that informants and enumerators used "pasture" as a residual category for all types of low-value land.
- Modern institutions such as schools, factories, health care clinics, etc., are completely absent from the picture of impacted resource and institutional areas. This may be because the typical affected community is rural and has few such institutions anyway. Roads are more commonly blocked. However, since most contaminated land also carries some trails, however small, the category "local roads and trails" tells little about main roads. More importantly, only 5 percent of the communities suffer from mine-impeded access to administrative centers.

The complex picture can be simplified by distinguishing four major prevalence levels and by ordering the corresponding resource types by intuitive value:

- A large majority (89 percent) of the affected communities suffer reduced access to their low-value land holdings.
- Thirty-eight percent of the communities have some firewood and timber areas and/or rain-fed farms blocked by mines. These resources have some intermediate value.
- At the high-value end, the blocked water and irrigation complex affects an estimated 13 percent of all communities.
- Blocked roads to administrative centers affect 5 percent of all communities; blocked housing areas affects 4 percent.

FIGURE 6

BLOCKED AREAS: PREVALENCE AND VALUE

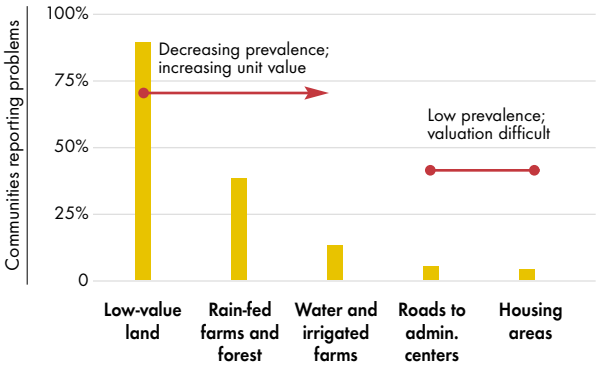


Figure 6 represents these magnitudes for better visual appreciation.

Eventually, the size of the population affected by a particular problem as well as the numbers and surface of the mined areas involved can be calculated as summarized in Table 15. It should be kept in mind that a given mined area may be blocking several resource types, and thus the overlap between these categories is considerable.

TABLE 15

MAGNITUDE OF BLOCKED ACCESS

Type of impact	Communities affected	Population of those communities	Mined areas involved	Estimated surface (sq km)
Pasture	529	712,936	921	906.3
Rain-fed farms	148	218,889	206	160.5
Local roads and trails	128	168,966	204	545.2
Wood foraging	103	128,249	149	145.6
Water, other purposes	54	88,797	65	261.4
Drinking water	45	76,729	58	257.8
Irrigated farms	34	58,605	45	114.8
Roads to administrative centers	27	23,671	45	25.6
Housing	24	65,980	29	10.6
ALL IMPACTS COMBINED	**592**	**827,794**	**1,078**	**922.7**

TYPICAL COMBINATIONS OF IMPACTS

The Landmine Impact Survey seeks to understand the socio-economic impact on communities in which access to various resources are blocked by mines. The survey has revealed five basic groupings reflecting the types of resources made unavailable to communities by mines. These groupings are called "clusters" of impacts and are reflected in Table 16. A sixth category of "cluster" is added as a residual, or infrequently used category. The categories are as follows:

- *Type A* refers to the presence of landmines in pasture or other low-value land and characterizes 376 communities.
- *Type B* refers to the presence of mines in pastureland and also in or near local roads and trails and characterizes 102 communities.
- *Types C, D, and E* also involve mine-contaminated pastureland but include blockages to various water resources and irrigation. These three categories characterize 71 communities
- *Type F* "clusters" are a residual category and characterize 43 communities.

TABLE 16

IMPACT COMBINATIONS

Type	A	B	C	D	E	F	Frequency
Pasture	■	■	■	■	■		89%
Rain-fed farms			▒				25%
Local roads and trails		■		■			22%
Wood foraging (nonagricult. land)					▒		17%
Water, other purposes			■	■			9%
Drinking water			■	■			8%
Irrigated farms				▒	■		6%
Roads to administrative centers			▒			▒	5%
Housing						▒	4%
COMMUNITIES CONCERNED	**376**	**102**	**27**	**23**	**21**	**43**	

Note: Cells in black designate impacts that are always or almost always present in the communities of the particular type. Gray stands for impacts that occur in the particular type at a frequency much higher than its average frequency across all types.

A number of important results follow:

- The major differentiating factors are local roads and trails, water and irrigation. Pasture blockages are omnipresent, except in the residual type F, and do not differentiate among types.
- Local roads and trails are difficult to evaluate. Most of the communities that reported this type of blockage reported pastureland as the only other type of contaminated resource. Without additional information, therefore, local road blockages cannot be assumed to contribute to the severity of the mine impact.

- Rain-fed farms, wood-foraging areas, major roads and housing areas were not the dominant target of mining. While rain-fed farms and housing areas do significantly occur in conjunction with water blockages, and wood-foraging is connected to irrigation, none of these discriminates strongly enough to define a type.
- The primary factor that sets some infested communities apart from others, therefore, is the presence or not of mines interdicting access to water. Water-deprived communities include those with problems with their drinking water supply, with water sources that serve other purposes, and finally with the irrigated farmland itself.

The importance of access to water will be highlighted further in the analysis of mine accident causes. It should be noted that blockages in areas of wood gathering, a typically female activity, have probably been underreported. Better data on this particular variable might result in its stronger association with some impact type or in the creation of yet another type.

Summary of Past Mine Action

The survey also gathered information about the nature of mine action activities—mine awareness education, marking and surveys, victim assistance, and mine clearance—that have already taken place in mine-affected communities. The presence of such activities—whether introduced by outside agencies or locally initiated—may speak to the strength of skills and traditions upon which future action can build. The extent of exposure to these activities also reveals the magnitude of needs likely not yet covered.

TABLE 17

INTENSITY OF MINE ACTION PENETRATION, BY SOURCE AND ACTIVITY

Exposed to mine action in the past two years	Communities	Percent
From outside:		
Mine awareness education	27	4.6%
Marking and surveys	4	0.7%
Victim assistance	2	0.3%
Mine clearance	5	0.8%
From inside:		
Mine awareness education	2	0.3%
Local mine clearance	125	21.1%

Note: Percentages based upon 592 affected communities.

Table 17 gives the total number and percentage of confirmed exposure of some type of mine action activity during the past two years for the 592 affected communities. These measures offer some insight into the rarity of such contacts.

Three levels of activism emerge:

- At the lowest end, the incidence of "marking and surveys," "victim assistance," and of "mine clearance" was reported in only a small fraction of all affected communities. However, some informants may have chosen not to disclose previous exposure in the hope of attracting assistance to their communities.
- A considerably higher portion of the surveyed communities—roughly one in every twenty—remembered at least one "mine awareness education" event. Most of these events took place at the initiative and by the means of outside agencies. Two local initiatives were reported; in one community, government officials assisted.
- At the highest end, there were some "local initiatives to clear mines and UXO." During the period of time considered, one in every five communities resorted to some activity aimed at eliminating some of the threat. The spectrum of regularity, methods and expertise is very wide. In one community, for example, an army person on home leave gave a hand in ridding his community of some of the mines. Others talked about their clearing mines in an aura of heroism, citing the exact number of mines that their predecessor had lifted before he was killed.

The survey did not elicit information about the kinds and frequency of local victim assistance, nor about the oral or other cultural equivalents of surveying and marking. It may be assumed that these local activities compensated with regularity and accessibility what they may have been lacking in professionalism. Therefore, it seems reasonable to conclude that local initiatives were far more prevalent than assistance from outside. Also it seems obvious that in all branches of organized mine action the affected communities remain undersupplied.

The fate of an unassisted victim

Mrs. Z. is a widow in her 40s, without children. She was injured in a mine explosion at age 10. Ever since then, she has not been able to work with her right hand. She was married to an old man in poor health. She describes her marriage as joyless, with her having been more of a nurse than a wife. Her husband died some years ago; Mrs. Z. does not consider remarrying.

Although the survey notes do not say so, one may assume that Mrs. Z. never had the benefit of reconstructive surgery. Moreover, the selection of her marriage partner may have been conditioned by the public evaluation of her disability. The forces responsible for emplacing that landmine destroyed the happiness of a girl and the woman she later became.

In a population of several thousand mine accident survivors, there are bound to be many who have experienced a similar fate. Improved victim assistance capacity will ease the hardship for some of them.

Factors Influencing Mine Clearance

With the data developed by the survey that is mined area specific, planners will be able to configure, in broad terms, the particular tools that will need to be mobilized and the training routines that will be required for demining units.

SIZE OF MINED AREAS

Mined areas range in size from a few thousand square meters to several square kilometers. Method of clearance is partly determined by the size of mined areas. For instance, large flat areas are most suitable for mechanical clearance, while small areas are most suitable for manual demining teams. Size also influences the structure of the technical survey and demining teams and their training. Table 18 indicates the size of mined areas.

CONTAMINATED LAND BY VEGETATION AND TERRAIN

The 1,078 identified mined areas have different ground profiles and are covered by different types of vegetation, factors that are critical to clearance. Table 18 breaks the mined areas down by ground profile and vegetation.

TABLE 18

MINED AREA SURFACE, BY VEGETATION AND GROUND PROFILE TYPES

	Ground profile			
Vegetation	Flat land only	Contains gullies, hillside, or ridge	Other (e.g. moving sand dunes)	Total
None	21.8	6.0	0.1	27.9
Short grass only	292.0	162.5	34.2	488.7
Tall grass, at least some	100.9	3.3	0.0	104.3
Bushes or trees, at least some	119.1	87.5	94.2	300.8
Other	1.0	0.0	0.0	1.0
TOTAL	**534.8**	**259.3**	**128.5**	**922.7**

More than half of the estimated surface area is covered by short grass only, or by nothing at all. In another third, however, bushes and trees form potential obstacles to some clearance techniques. Similarly, more than half of the suspected area is flat land. Terrain that contains gullies, hills and ridges accounts for another quarter. A significant remainder consists of moving sand dunes, chiefly in the governorates of Mareb, Shabwah, Hadramout, Lahij, and Abyan. A very small part consists of built-up areas.

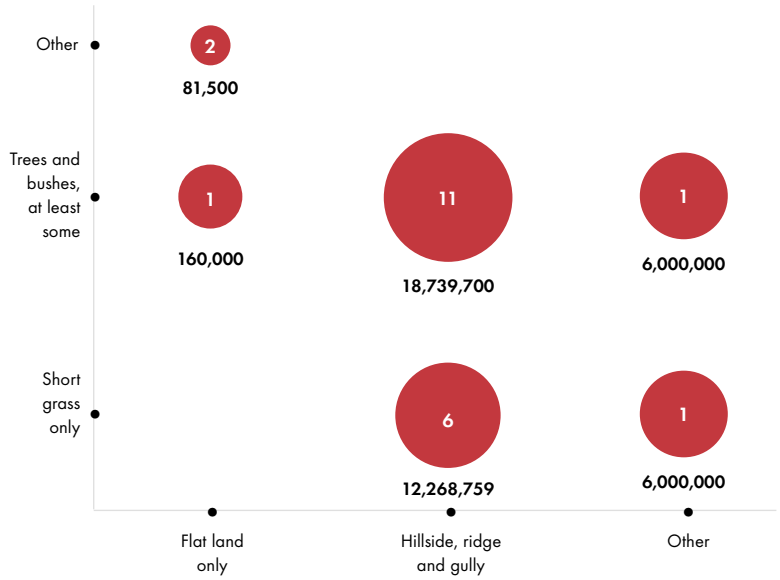
As a result, one third of the estimated contaminated area presents the lowest degree of clearance difficulty, the combination of flat land and no vegetation or short grass only. One-fifth presents the greatest degree of clearance difficulty, the combination of rugged features or moving dunes with wooded cover. The remaining surface presents intermediate degrees of difficulty to clearance.

Vegetation and terrain in the high-impact communities

Of special interest is the degree of difficulty that deminers are likely to face if they are deployed to the 14 communities that the survey identified as highly impacted. This graph cross-summarizes the estimated mined area surface for each combination of terrain and vegetation type. It can be seen in Figure 7 that the ideal combination for clearance, short grass, and flat land only, is entirely absent from this set of mined areas.

Fortunately for mine clearance, only part of the mined areas is usually covered by trees and bushes. The basis for selective demining within the high-impact communities will have to be established during the technical surveys.

FIGURE 7



The figures under the circles represent surface area in square meters. Figures in the centers of the circles denote the number of distinct mined areas in each combination. "Other terrain" primarily is moving sand dunes and built-up areas.

CONTAMINATED LAND BY ORDNANCE CLASS

Also important to the choice of clearance technique, the requisite skills and logistics arrangements are the types and distribution of munitions in the contaminated areas. The survey elicited information about generic types of munitions, i.e. anti-personnel mines (AP), anti-tank mines (AT) and UXO.

Table 19 provides a breakdown of the mined areas by munitions type.

More than two-thirds of the suspected surface areas have mixed contaminants. Another considerable part of the area is suspected to be contaminated primarily by anti-personnel mines. Areas having only AT or UXO contamination make up almost one-tenth of the total area.

TABLE 19

AFFECTED COMMUNITIES, MINED AREAS, SURFACE, BY MUNITION TYPE

Munitions	Communities	Mined areas	Estimated surface area
AP	322	631	157.1
AT	50	128	49.2
UXO	32	59	38.3
Mixed	188	260	678.1
TOTAL	**592**	**1,078**	**922.7**

Note: Area is in square kilometers. Mixed munitions may be AP+AT or mines+UXO.

Community Background and Mine Effects

COMMUNITY ADAPTATION

The history of conflicts that created the landmine and UXO hazard in hundreds of local communities is well known to Yemenis and is not the subject of this survey. However, much less is known about the response that the affected communities have developed to the hazard. The large number of local mine clearance efforts suggests that this response has been active. In more than one instance, community leaders visited by enumerator teams confirmed that there had been polluted areas in the past, only to add that these had been successfully cleared.

Where the hazard continues, it may be assumed that the communities go on refining their response to it. This includes the communications that community members exchange on threat assessment and reduction, the circumspect use of resources in dangerous areas and the continued search for, and development of, alternatives.

Social science assumes that the response depends not only upon the nature of the hazard, but also upon the social factors that operate on those exposed to it. Community adaptation, much like individual adaptation, is circumscribed by history as well as current organization and resources. Unfortunately, in the case of a landmine problem affecting a large number of communities, it is difficult to find indicators that are universally available *and* that make a valid point about the degree of successful adaptation to the mine hazard.

One such candidate is the ability to avoid mine accidents. It stands to reason that the ability to know the location of landmines, to develop alternatives to the use of resources trapped in polluted areas, and to mobilize outside connections for clearance should be inversely proportional to the risk of new accidents. Also it is plausible to assume that not all communities can build this ability to similar degrees. Moreover, the choice of this indicator is motivated by the belief that the data about recent mine accident victims is of good reliability.

Statistical methods were used to find associations between recent mine accidents and the social characteristics of the communities in which they happened. Knowledge of such correlations can help to determine indicators of vulnerability to which the mine action community in Yemen (and elsewhere) should be sensitive. Also, it may help to validate the method used in scoring and classifying the affected communities for priority attention.

It does not, however, obviate the need to listen to the concerned communities and to other knowledgeable groups about what they have to say due to long-term adaptation and rehabilitation. In this regard, it is hoped that the case studies appended to the main report will bring to the fore a healthy dose of local insight and knowledge.

Factors considered for the adaptability of the communities

A great many factors affect a community's ability to deal with mines and UXO; the survey did not gather information on all of them. The survey did, however, collect data on a number of variables that are commonly thought to be relevant to community adaptation and/or landmine situations.

1) THE SIZE OF THE CURRENT POPULATION

Other things being equal, more people means more chances to interact with the hazard. In addition, in poor communities with few alternatives, more people may increase the pressure on the available resources. A positive correlation with accidents is assumed. However, it is possible that mines may affect the land or property of a few people only and not the entire population, in which case the relationship between population size and accidents is not direct.

2) THE INSTITUTIONAL ENDOWMENT OF THE COMMUNITY

The more complex the local institutions the more abundant should the skills be to reduce the hazard and also the ability to develop alternatives. The method for measuring this is described below.

3) THE EXTENT TO WHICH MINES BLOCK CRITICAL RESOURCES

In the light of the previous analysis, our model defines water as a critical resource. It is assumed that communities cut off from some of their water sources tend to have more mine accidents than communities with unimpeded access.

4) THE LEGACY OF THE CONFLICT

This is expressed in three dimensions: the estimated surface of the mined areas in the community, the intensity of regional landmine use as indexed by the distance to the nearest other community with some recent victims, and by the number of years that have passed since mines or UXO were last planted in the community. In some models, the location of mined areas vis-à-vis the dense social space, as measured by the distance from the center of the community to the nearest mined area, was also considered.

Readers may readily appreciate the first and third factors. The second and fourth demand more explanation. The nontechnical part is given here, and technicalities are relegated to the appendix.

The institutional endowment of the community

There is a long-standing belief in the social sciences that richer and more complex institutions can transact information more effectively and can thus help their host communities solve problems. However, this belief needs to be tested in the field against the fallacies of bureaucracy and social barriers. To measure the institutional complexity of the Yemeni communities, the survey used eight indicators:

1. Is the community an ordinary village, or is it the center of a higher administrative tier (subdistrict or upward)?
2. Does the community have a primary school?

3) Does the community have a secondary school?

4) Does the community have a health care facility?

5) Is the community connected to a telephone service?

6) Do at least some of the households have access to piped water supply?

7) Do at least some of the households have electricity?

8) Is motor fuel available locally?

Analysis of the survey revealed highly significant correlations among these indicators. These eight indicators tend to cluster into two groups that seem to reflect institutional modernization on the one hand and technical modernization on the other hand. The first four indicators from the above list form a common factor that points toward the degree of institutional modernization of a community; communities ranking high on these traits have a higher institutional modernity compared to those ranking lower on these traits.

The next three in the list form a cluster that indicates the degree of technical modernization of a community. The last indicator—the availability of fuel in the local market—statistically is shared between the two clusters. Conventionally, it is grouped with the institutional indicators, the rationale being that institutions with mobile members, i.e., members who have cars and buses, are those which transact more efficiently with the outside world. The technical component of having fuel in the market, however, may indicate commercial employment alternatives that ease the pressure to exploit marginal and unsafe land.

TABLE 20

COMMUNITY MODERNIZATION INDICATORS

Modernization factor	Indicator	Percent affected communities with this feature
Institutional	Primary school	56%
	Health care facility	17%
	Secondary school	15%
	Fuel in local market	11%
	Administrative center	10%
Technical	Electricity	24%
	Piped water supply	19%
	Telephone service	9%

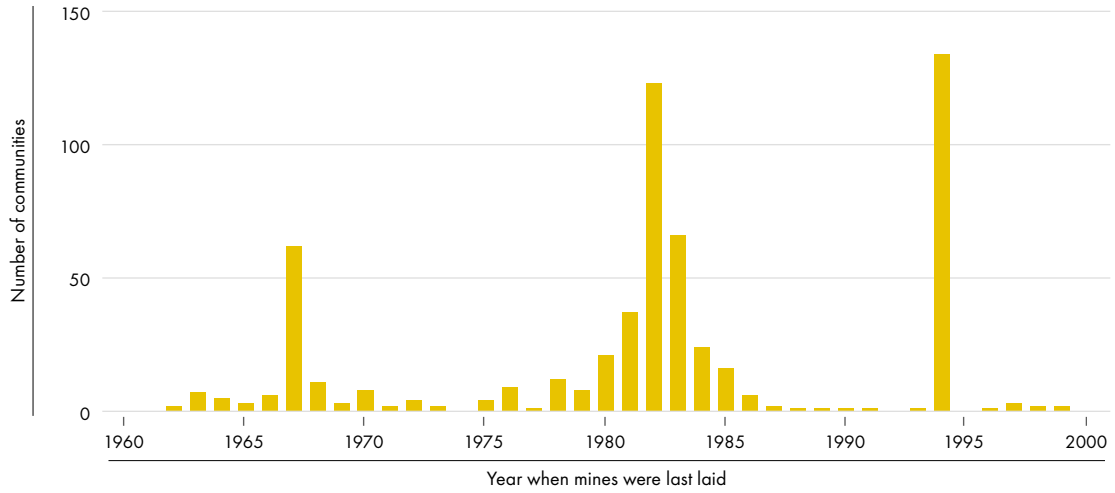
Table 20 shows the percentage of affected communities that have these characteristics. A more technical exposition is found in the appendix.

The legacy of the conflict

Another of the main indicators used to measure mine impact is the number of years that have passed since landmines or UXO were last emplaced in the community. The assumption is that the more time that has elapsed since the last mines were planted, the more time the community has had to become familiar with the locations of mines and UXO and to find ways around them, as well as to develop alternatives to resources.

FIGURE 8

COMMUNITIES BY YEAR MINES OR UXO LAST EMPLACED



As shown by the history of modern Yemen, there are more communities with recently laid mines than with many years of elapsed time without mining. The timeline of Yemen's conflicts can be seen indirectly in Figure 8.

It has been thought that the intensity of armed conflict is spatially concentrated and that this extends to the density of mining or UXO contamination, such that the more intense the conflict, the greater the density of mines within a region. It is therefore reasoned that accidents in one community may predict accidents in neighboring communities. This measure may be approximated by the distance to the nearest community with recent mine victims.

Factors influencing the probability of mine accidents

As noted previously, 78 of the 592 affected communities suffered one or more mine accidents in the past two years. There were a total of 178 victims. The number of victims in a particular accident depends upon situational factors and is not likely correlated with the social structure of the community. The key informants may not reliably know the number of mine incidents. Therefore, this analysis is limited to investigating the association of risk factors with the simple fact of whether the community has had any mine accidents during the last two year period or not.[3]

The strongest predictor of a new accident is whether or not there had been an accident in a neighboring community. The risk of new accidents increases considerably if neighboring communities have also suffered mine accidents.

The degree of technical modernization is the second most important factor in predicting mine accidents, and access to water bodies is the third most important

[3] Additional computer simulations were run using the number of recent mine victims. The results of these simulations are presented in the appendix on supporting analysis.

factor. A low degree of technical modernization and great pressure upon water resources are associated with increased risk of accident. Next, the length of the post-conflict period and the estimated polluted surface area are factors influencing the risk of mine accidents.

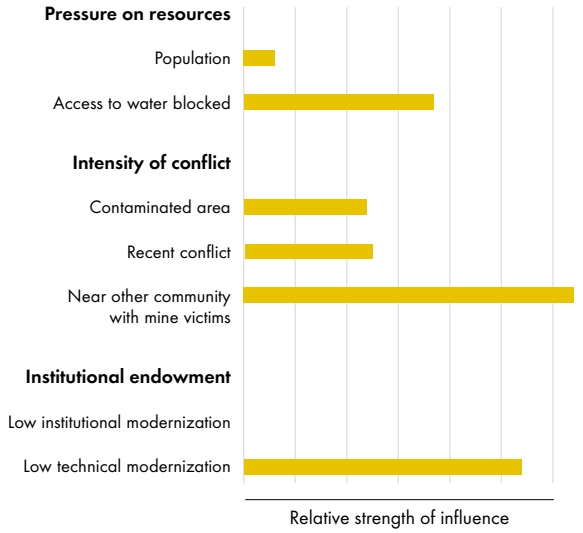
Population size is positively associated with accident frequency, but this is a weak connection.[4] The institution of private property may reduce opportunities to interact with mined terrain for all but the legal owners, and thus even if the population is large, not many additional people will walk into privately or group-owned mined territory. But this is mere speculation.

Surprisingly, the degree of institutional modernization is not associated with the decreased risk of mine accidents. This result flies in the face of conventional wisdom. Practical implications of this and other findings are suggested below.

Figure 9 portrays the relative influence of these factors.[5] Each is phrased in a way that makes its presence a contributor to the accident risk. For example, "recent conflict" stands for the negative of the number of years since mines where last emplaced (because the longer the post-conflict period, the smaller the accident probability). The factors are grouped into three larger domains: "Pressure upon resources," "Intensity of the conflict," and "Institutional endowment."

FIGURE 9

CONTRIBUTORS TO MINE ACCIDENTS



It is remarkable that the strengths of the factors within each domain differ as much as factors across domains, except for the intensity of the conflict. Nevertheless, all three groupings are consistently significant. This may be taken as an indication that the historic legacy in terms of the intensity and scale of conflict more strongly determines the local landmine impact than the current resource structure.

[4] Some of the models using the number of recent victims do suggest that increasing population size significantly increases the mine accident risk. The question of big vs. small communities, therefore, has to be reevaluated carefully when it comes to utility questions in resource allocation.

[5] The length of the bars is proportionate to the regression coefficients of the logistic regression model.

COMMUNITY PROFILES

Six community profiles, three that rank the highest for mine accident risk and three that rank the lowest, are presented in Table 21 and illustrate the use of this prediction model. These six communities are from five different governorates.

Two out of the three high-probability accident communities actually have had some accidents in the two-year period prior to the survey. None of the three low-probability communities have had an accident. The reader's attention is drawn to the fact that all three high-probability communities saw some or all of their drinking water supplies blocked. This is not true of any of the low-probability communities. It will not be difficult to detect the significant differences in several of the other factors.

TABLE 21

MINE ACCIDENTS AND COMMUNITY BACKGROUND VARIABLES—EXAMPLES

	Communities with highest accident probabilities			Communities with lowest accident probabilities		
	Bait Mashrah, Ibb	Al-Qafleh, Al-Dhale'	Al-Masharih, Al-Dhale'	Tandhoor, Sa'ada	Naseeb Al-Mahjar, Mareb	Imsara, Abyan
Probability of some mine accident in 2 years	0.51	0.50	0.48	0.01	0.01	0.00
Impact score	7	9	12	3	3	2
Actual number of recent victims in the past 2 years	0	1	3	0	0	0
Population	2,000	600	350	150	140	4,000
Access to irrigation blocked	No	Yes	No	No	No	No
Access to drinking water blocked	Yes	Yes	Yes	No	No	No
Year mines last laid	1982	1983	1986	1966	1967	1972
Contaminated area (sq m)	5,000,000	640,000	6,000,000	600	12,000	32,000
Distance to nearest other community with recent victims (km)	3.8	0.5	1.2	21.9	30.3	25.3
Piped water	No	No	No	No	Yes	Yes
Electricity	No	No	No	Yes	Yes	Yes
Telephone	No	No	No	Yes	Yes	No
Health care facility	Yes	No	No	No	Yes	Yes
Primary school	Yes	Yes	Yes	No	Yes	Yes
Secondary school	No	No	No	No	Yes	Yes

Consequences for Mine Action

GENERAL PLANNING CONSIDERATIONS

A number of consequences for practical action flow from the findings of the two previous sections.

First, high-risk communities tend to be clustered near each other. There may, however, be communities within a heavily mined region and near other communities classified as high-risk that did not receive a high-impact classification. This phenomenon may be because there were not many mine victims in the previous two years. Therefore, when technical survey teams move to communities classi-

Mine action and the communication of public trust

Al-Heswa, in Buraiqa district near Aden, was the scene of intense fighting during the 1994 war. The existence of two mined areas testifies to this. Nowadays, the community is finding itself in the center of an important government project, the Aden Free Trade Zone. Demining teams have been deployed to Al-Heswa and to some of its neighbors, in an effort to make development safe. The job may take a long time to complete; the contaminated areas are large.

Although farming and fishing are the economic mainstays, and there is only one badly overcrowded primary school, Al-Heswa is not an unsophisticated community. It enjoys 24-hour electricity and water supply and is linked to a telephone service. Its people are at ease using the services of the nearby city of Al-Shaab. Many of its young study there.

It is in this spirit of openness that the farmers and herdsmen of Al-Heswa have for years been in the habit of reporting newly detected munitions to the army. The army has responded by sending EOD personnel who removed a number of mines.

Many farmers do not believe that the areas were reliably cleared. They are keeping a meticulous record of animals hurt by mines—nine camels, five cows, and nearly 60 goats to date. The leader of the demining team currently camped in a corner of Al-Heswa is determined that his men will do the job to international standards. He is concerned not only with keeping up the health and spirit of his men against heat, moving sand dunes and clouds of mosquitoes, but also with communicating their work methods and care to the people who will eventually benefit from the effort.

Community meetings and public lectures have been held, and leaflets and brochures have been given out in order to foster trust and understanding for the government effort. In 1997 the army marked the mined areas and surrounded them with barbed wire. This will not keep the mosquitoes away from the deminers sweating in their armor, but the civilians may appreciate that they and their loved ones are being kept out of harm's way.

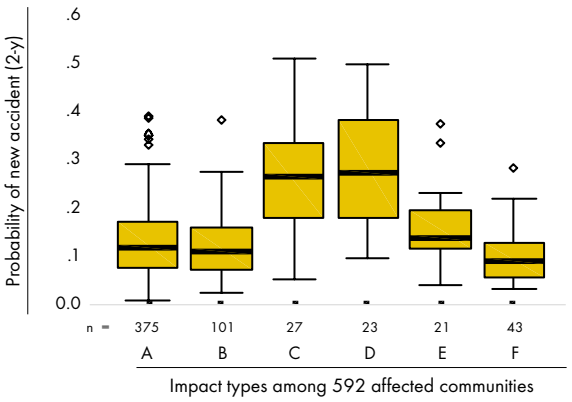
fied as high impact, it may be appropriate for them to visit neighboring affected communities as well, even if these were classified low or medium priority by the Landmine Impact Survey. The extent of such visits may be determined by a host of factors, but technical survey work plans that look at *clusters of communities* may not only have advantages for logistical efficiency, but also may be more effective eventually in reducing the risk.

Second, care needs to be taken again not to discriminate against small communities in the allocation of mine action resources. The scoring mechanism used in this survey already has a built-in safeguard, not using population size as a scoring factor. Still, the belief may be common that if you rid a large community of mines first, you save more lives than by starting with a small community. The calculations suggest that this may not be the case. While there may be other considerations, particularly related to local development projects, that could possibly favor larger communities for mine clearance, *small communities* deserve equal attention on life-saving grounds.

Third, the effects of technical modernization such as new employment and convenient piped water supply reduce the mine hazard. However, this is not an area currently included in the definition of mine action. The lack of a relationship between institutional modernization and mine hazards indicates that even when institutions exist, they cannot be relied upon for reducing the risk of mine accidents, for example, through mine awareness training. In particular, local teachers and health care personnel, often considered the ones who spearhead community education, may not by themselves be active agents for mine awareness and organized action. Such initiatives may come mostly from other groups in the community, or may need well-designed support programs from outside agencies in order to involve local people effectively. These support programs may include appropriate extension channels and mine awareness curricula.

FIGURE 10

IMPACT TYPE AND ACCIDENT HAZARD



Type C and D: Blocked water bodies
Type E: Irrigated farms blocked
For comparison: Type A and B: Only pasture and local roads blocked

The effects of blocked access to water cannot be overly emphasized. As the boxplot (Figure 10) clearly shows, the median probability of a new accident in the next two years for an affected community with blocked access to water is close to 30 percent, three times as much as in communities that complain of low-value land blocked only.

TECHNICAL PLANNING CONSIDERATIONS

The Landmine Impact Survey is not designed to investigate technical mine action issues in detail. This will be done during subsequent technical surveys. However, the Landmine Impact Survey provides valuable information for use in the techni-

cal survey and gives an indicator of some of the challenges that will be faced by mine action planners.

DISTRIBUTION CONSIDERATIONS

The 14 communities classified as highly impacted have a combined estimated mined surface area of 43 square kilometers. A major portion of this surface is concentrated in three governorates: Al-Dhale' with seven communities accounting for 37 percent of the surface, Ibb with one community accounting for 34 percent of the surface, and Abyan with two communities accounting for 27 percent of the surface.

Likewise, the 57 communities that have reported impact upon water sources are concentrated geographically in the governorates of Hadramout, Ibb, and Al-Dhale'.

TABLE 22

SIZE OF MINED AREAS IN RELATION TO MUNITIONS TYPE AND VEGETATION COVERAGE

	Type of munitions				Vegetation				
Area in square meters	AP	AT	Mixed	UXO	None	Short Grass	Tall Grass	Bushes and Trees	Other
Less than 10,000	26	2	14	3	7	23	0	15	0
10,001 to 100,000	16	0	0	0	0	11	0	20	0
100,001 to 500,000	17	0	4	1	0	11	1	10	0
500,001 to 1,000,000	6	0	3	0	0	1	0	7	1
1,000,001 to 5,000,000	10	0	4	1	0	8	0	7	0
More than 5,000,000	3	0	8	0	0	8	0	3	0
TOTAL	**78**	**2**	**33**	**5**	**7**	**62**	**1**	**62**	**1**

CLASS OF MUNITIONS

Mine type is an important factor in determining clearance methods and equipment requirements. For instance, machines designed for clearing areas with anti-personnel mines cannot safely be used for clearing anti-tank mines. The mined area size, relative to munitions type and vegetation coverage, is shown in Table 22.

Of the 1,078 mined areas, 631 covering a total of 157 square kilometers are contaminated with anti-personnel mines and 128 mined areas with a total of 49 square kilometers are contaminated with anti-tank mines. Fifty-nine mined areas covering an area of 38 square kilometers are contaminated with UXO only. Table 23 provides more details regarding the various types of munitions. Table 24 details

TABLE 23

ALL YEMEN—
MINED AREA DISTRIBUTION BY CLASS OF MUNITIONS

Type of mine	Mined areas	Contaminated surfaces (sq m)
AP	631	157,149,373
AP,AT	114	446,389,765
AP,AT,UXO	49	188,928,804
AP,UXO	65	7,310,565
AT	128	49,212,706
AT,UXO	27	32,767,650
Unknown	5	2,660,000
UXO	59	38,308,018
TOTAL	**1,078**	**922,726,881**

TABLE 24

COMMUNITIES WITH HIGH IMPACT AND WATER RESOURCE BLOCKED— MINED AREA DISTRIBUTION BY CLASS OF MUNITIONS

Type of mine	Mined areas	Contaminated surfaces (sq m)
AP	78	53,668,869
AP,AT	15	209,752,000
AP,AT,UXO	9	35,300,500
AP,UXO	19	1,375,445
AT	4	211,000
AT,UXO	3	2,900,000
UXO	6	2,334,018
TOTAL	**134**	**305,541,832**

the type of contamination found in communities with high impact and/or water blockages.

It can be seen that a mixture of anti-tank and anti-personnel mines covers an area of 446 square kilometers that is 48 percent of the entire mine-affected areas in Yemen. A mixture of anti-personnel mines, anti-tank mines, and UXO accounts for more than 20 percent of the total mined area in Yemen. A mixture of anti-tank mines and UXO accounts for 3.5 percent of the total mined areas. Combined occurrences of anti-personnel mines and UXO cover a small area that is about 0.8 percent of the total mined areas. UXO alone cover an area of 38.3 square kilometers, which is 4 percent of the affected areas.

VEGETATION AND SURFACE

More than 50 percent of all mine-contaminated areas in the Republic of Yemen are flat areas with no vegetation or short vegetation. The survey also found that of the 71 high- and medium-impacted communities, 62.5 percent of the areas have short grass and bushes or trees. Such areas are best suited for clearance by explosive detection-dog teams and/or appropriate mechanical means. Experience shows that mine detection dogs can easily work in mined areas with short grass.

About 300 square kilometers (30 percent) are located in areas covered by trees or bushes. This requires grass cutting equipment and additional training of staff to clear such areas.

Mining of built-up areas is not a major problem in Yemen. This will eliminate the need to invest in equipment designed for built-up area clearance and extensive training of mine action staff for this purpose.

AGE OF MINED AREAS

Based on community responses, three distinct periods of mining are evident: 1962–1969, 1970–1983, and the war of cessation in 1994. See Tables 25 and 26 for the between age and size of mined areas.

Older mined areas make up a relatively small portion of the problem—3 percent of the total and 5.5 percent in the highly impacted communities. More mined areas were created during the middle period of 1970–1983. However, the sizes of the mined areas are much smaller. A major portion (more than 75 percent of the total and more than 81 percent in the highly impacted communities) of the mine problem has resulted from the 1994 conflict in the central and eastern governorates. In addition, size of the mined areas from the latest conflict are significantly larger. The size of mined areas from this period average 3 square kilometers per mined area. Again, the governorate of Hadramout has many of the largest mined areas.

TABLE 25

AGE AND SIZE OF MINED AREAS

Age of conflict	All Yemen		All Yemen excluding Hadramout	
	Mined areas	Contaminated surfaces (sq m)	Mined areas	Contaminated surfaces (sq m)
1962-1969	246	26,940,339	246	26,940,339
1970-1983	605	197,269,574	563	162,509,934
1994	227	698,516,968	211	341,659,968
TOTAL	**1,078**	**922,726,881**	**1,020**	**531,110,241**

TABLE 26

AGE AND SIZE OF MINED AREAS

Communities with high impact category and water resource blocked

Age of conflict	Including Hadramout		Excluding Hadramout	
	Mined areas	Contaminated surfaces (sq m)	Mined areas	Contaminated surfaces (sq m)
1962-1969	26	1,710,750	26	1,710,750
1970-1983	80	54,589,464	79	53,589,464
1994	28	249,241,618	19	20,201,618
TOTAL	**134**	**305,541,832**	**124**	**75,501,832**

It is to be noted that older mined areas are smaller because local communities have learned, through tragic accidents in most cases, that the actual size of mined areas is smaller than initially assumed. This leads to the conclusion that the large reported sizes of the 1994 conflict mined areas need to be investigated properly by the technical survey teams. This will probably result in a significant reduction of mined areas and a saving of time and resources for demining teams.

MINE AWARENESS

Survey results can help in planning effective mine awareness programs. Knowing the age and sex of the victim as well as the activity at the time of the accident can help determine appropriate messages and delivery mode for the mine awareness curriculum.

- *Age and sex of the victims:* Of the 178 recent victims 42 are female and 136 are male. Children younger than 15 years of age account for 43 percent of female victims and 35 percent of the male victims. In the age group between 15 and 44 years, 31 percent of the victims are female and 56 percent are male. This means that more mine awareness messages should be targeted to female children and male adults.
- *Location of victims:* There is a preponderance of recent landmine victims, 16 female and 43 male (or 33 percent of the total for Yemen), located in the governorate of Al-Dhale'.

- *Activities of landmine victims:* For both males and females, herding animals and tampering with mines are the main activities causing mine incidents. Herding causes 37.5 percent of all the recent mine incidents while tampering with mines is responsible for 29 percent of the mine incidents in Yemen. Other activities during mine incidents include farming (10 percent), collecting food/water (5.5 percent), playing (3.5 percent), travel (1.7 percent), military (1 percent) and others (9.5 percent).

More detailed analysis of victim data at the local level can support even more specific message development and suggest appropriate means of delivery. For instance, of 40 people involved in mine incidents as a result of tampering with landmines, 23 of them are in the governorate of Al-Baidha.

- *Geographical Location:* It is also important to prioritize and target locations of any planned activities. The highest number of landmine incidents have taken place in the governorates of Al-Baidha and Al-Dhale'. They respectively account for 19 percent and 33 percent of the total number of recent landmine victims in Yemen. The governorates of Ibb and Lahij account for 7.8 percent and 8.4 percent of the victims respectively.

For more detailed information related to mine victim injuries and treatment, see Tables 27 and 28.

LANDMINE VICTIM ASSISTANCE

- *Care:* The care and rehabilitation facilities in Yemen are insufficient. In the last two years, only four of the 178 landmine victims received some rehabilitation assistance. This is not satisfactory by any standard. Emergency care in medical facilities has been provided to 59 percent of the victims. However, the standard of care is extremely poor. This statement is supported by the fact that 54 victims died after making it to some kind of medical facility. Only three cases have been reported in which the victims died before making it to a medical facility. A total of 6.9 percent of the victims have received other types of emergency care. The lack of emergency care seems to be uniform across the country.

- *Types of Injury:* Of the 178 persons involved in mine accidents in the last two years, 57 lost their lives. Of the remaining survivors, 55 had an amputation, 14 lost their sight and 66 reported other minor injuries. For details and geographical distribution, see Table 28.

TABLE 27

CARE RECEIVED BY MINE VICTIMS

Governorate	Emergency	Rehab	Other	None	Fatal	Total
Abyan	3		1		8	12
Aden	1				3	4
Al-Baidha	29				5	34
Al-Dhale'	34	2	4		19	59
Al-Jawf	1				1	2
Dhamar			1		8	9
Hadramout			1			1
Hajja	2				2	4
Ibb	8	1	2		3	14
Lahij	12		3			15
Mareb			1			1
Sa'ada	7					7
Sana'a	5			1	2	8
Shabwah			3			3
Taiz	1	1			3	5
TOTAL	**103**	**4**	**16**	**1**	**54**	**178**

TABLE 28

TYPE OF INJURY SUFFERED BY MINE VICTIMS[6]

Governorate	Fatal	Amputation	Loss of sight	Other	Total
Abyan	8			3	11
Aden	3			1	4
Al-Baidha	5	15	1	13	34
Al-Dhale'	20	20	5	17	62
Al-Jawf	1	1			2
Dhamar	8			1	9
Hadramout				1	1
Hajja	2			2	4
Ibb	3	7	1	4	15
Lahij		3	1	12	16
Mareb		1		1	2
Sa'ada		3	2	3	8
Sana'a	4	2	3	4	13
Shabwah		2		3	5
Taiz	3	1	1	1	6
TOTAL	**57**	**55**	**14**	**66**	**192**

[6] The table shows a total of 192 victims; 14 survivors have had multiple wounds.

TABLE 29

SUMMARY: COMMUNITIES AND POPULATIONS AFFECTED, BY GOVERNORATE AND DISTRICT

	District	Communities affected	Population affected	Mined areas	Contaminated surface area (sq m)	Victims				
						Recently killed	Recently injured	Killed earlier	Injured earlier	All victims
Abyan	Khanfar	15	7,027	27	83,988,200	6	4	57	37	104
	Lowdar	3	4,525	4	441,500	2	0	17	1	20
	Modya	1	20,000	3	45	0	0	2	1	3
	TOTAL	**19**	**31,552**	**34**	**84,429,745**	**8**	**4**	**76**	**39**	**127**
Aden	Al-Buraiqa	15	43,690	27	54,490,000	3	1	32	45	81
	Al-Mansoora	1	2,000	1	420,000	0	0	6	0	6
	Dar Sa'ad	2	2,900	3	1,610,000	0	0	8	0	8
	Khour Maksar	1	150	1	3,000,000	0	0	0	0	0
	Sheikh Othman	1	950	2	2,410,000	0	0	0	0	0
	TOTAL	**20**	**49,690**	**34**	**61,930,000**	**3**	**1**	**46**	**45**	**95**
Al-Baidha	Al-Baidha	2	5,070	3	417,500	0	0	8	1	9
	Al-Sawma'ah	1	1,000	1	2,500	0	0	2	4	6
	Al-Taffa	1	300	1	10,000	0	0	2	0	2
	Al-Zaher	2	8,000	6	268,900	4	2	49	40	95
	Dhi Na'em	1	3,000	2	35,000	0	0	1	0	1
	Mukairas	12	49,080	19	2,464,750	0	23	126	77	226
	Rada'	35	58,663	73	12,216,300	1	4	156	143	304
	TOTAL	**54**	**125,113**	**105**	**15,414,950**	**5**	**29**	**344**	**265**	**643**
Al-Dhale'	Al-Dhale'	9	9,742	14	10,728,900	7	4	22	9	42
	Al-Hashaa'	2	800	2	21,500	0	0	5	2	7
	Al-Hussain	5	3,895	7	1,096,900	0	1	0	1	2
	Al-Sho'aib	4	8,760	5	290,000	1	2	0	8	11
	Damt	13	11,190	19	8,447,000	1	4	35	47	87
	Juban	15	47,240	24	6,496,150	0	2	33	35	70
	Qa'tabah	33	37,354	76	39,395,409	11	26	139	121	297
	TOTAL	**81**	**118,981**	**147**	**66,475,859**	**20**	**39**	**234**	**223**	**516**
Al-Hodaida	Al-Ras	1	700	1	1,000	0	0	3	2	5
	TOTAL	**1**	**700**	**1**	**1,000**	**0**	**0**	**3**	**2**	**5**
Al-Jawf	Al-Hazm	4	1,250	14	3,252,000	0	0	32	15	47
	Al-Humaidat	7	7,250	16	235,500	0	0	13	8	21
	Al-Matma	1	200	2	55,000	0	0	0	0	0
	Al-Zaher	4	1,600	13	730,000	0	1	19	15	35
	Khab Al-Sha'f	3	5,560	16	13,229,400	0	0	28	34	62
	Kharab Al-Marashi	1	100	2	75,000	1	0	0	0	1
	TOTAL	**20**	**15,960**	**63**	**17,576,900**	**1**	**1**	**92**	**72**	**166**
Al-Mahra	Houf	2	511	9	68,640	0	0	9	1	10
	Shahen	1	400	1	10,000	0	0	1	7	8
	TOTAL	**3**	**911**	**10**	**78,640**	**0**	**0**	**10**	**8**	**18**

(continued on facing page)

	District	Communities affected	Population affected	Mined areas	Contaminated surface area (sq m)	Victims				
						Recently killed	Recently injured	Killed earlier	Injured earlier	All victims
Amran	Harf Sufyan	1	450	2	100,000	0	0	0	0	0
	Raidah	2	40,800	3	990,000	0	0	23	12	35
	Thula	3	6,300	7	150,524	0	0	15	13	28
	TOTAL	**6**	**47,550**	**12**	**1,240,524**	**0**	**0**	**38**	**25**	**63**
Dhamar	Otmah	6	1,900	8	271,050	2	0	57	53	112
	Wesab Al-A'ali	10	1,990	15	1,130,500	6	1	45	10	62
	TOTAL	**16**	**3,890**	**23**	**1,401,550**	**8**	**1**	**102**	**63**	**174**
Hadramout	Al-Aber	6	5,790	7	93,017,000	0	0	46	5	51
	Broom	4	10,100	5	56,680,000	0	0	3	5	8
	Hajr Al-Se'ar	7	1,719	8	9,950,240	0	0	12	10	22
	Quf Al-Awamer	4	311	24	148,900	0	0	3	4	7
	Rakhyah	3	260	4	207,160,000	0	0	13	0	13
	Ramah	1	3,000	2	2,410,500	0	0	0	3	3
	Thamood	1	8,000	1	800,000	0	0	6	8	14
	Zamkh Wa Manoukh	6	3,372	7	21,450,000	0	1	19	23	43
	TOTAL	**32**	**32,552**	**58**	**391,616,640**	**0**	**1**	**102**	**58**	**161**
Hajja	Al-Meftah	2	2,520	6	67,600	0	0	12	20	32
	Al-Shaghadera	2	1,500	5	19,000	2	2	2	5	11
	Aslam	1	3,000	1	2,500	0	0	6	15	21
	Haradh	3	735	4	14,200	0	0	1	0	1
	Mabyan	2	2,300	2	1,200	0	0	11	16	27
	Najra	1	400	1	100	0	0	0	0	0
	TOTAL	**11**	**10,455**	**19**	**104,600**	**2**	**2**	**32**	**56**	**92**
Ibb	Al-Makhader	1	2,500	2	85,000	0	0	0	0	0
	Al-Nadera	55	43,782	98	65,506,200	2	9	291	240	542
	Al-Odain	5	2,930	6	762,500	0	2	11	6	19
	Al-Qafr	1	200	1	1,200	0	0	0	0	0
	Al-Radhma	16	10,500	31	5,647,600	1	0	68	77	146
	Al-Saddah	4	5,600	5	774,000	0	0	9	12	21
	Al-Sebrah	1	600	1	100,000	0	0	0	0	0
	Al-She'ar	5	1,490	9	1,089,440	0	0	18	9	27
	Ba'dan	5	5,070	9	352,900	0	0	43	28	71
	Yareem	2	1,250	3	442,025	0	0	30	34	64
	TOTAL	**95**	**73,922**	**165**	**74,760,865**	**3**	**11**	**470**	**406**	**890**
Lahij	Al-Madhareba	2	600	2	360,000	0	0	0	5	5
	Al-Melah	7	5,680	9	2,585,512	0	0	10	8	18
	Al-Musaimeer	3	2,700	4	2,432,500	0	0	2	6	8
	Al-Qabbaita	8	7,468	12	650,200	0	0	4	4	8
	Toor Al-Baha	4	3,860	7	3,313,000	0	1	3	1	5
	Tuban	28	83,850	45	81,014,906	0	14	29	72	115
	TOTAL	**52**	**104,158**	**79**	**90,356,118**	**0**	**15**	**48**	**96**	**159**

(continued on next page)

	District	Communities affected	Population affected	Mined areas	Contaminated surface area (sq m)	Victims				
						Recently killed	Recently injured	Killed earlier	Injured earlier	All victims
Mareb	Al-Jawba	9	2,674	13	3,446,650	0	1	53	28	82
	Hareeb	7	16,193	15	8,514,000	0	0	86	144	230
	Mareb	5	1,080	5	950,000	0	0	38	40	78
	Serwah	2	490	3	214,000	0	0	36	50	86
	TOTAL	**23**	**20,437**	**36**	**13,124,650**	**0**	**1**	**213**	**262**	**476**
Sa'ada	Al-Safraa'	12	17,145	34	519,800	0	5	33	22	60
	Ketaf	1	1,200	3	1,625	0	0	1	2	3
	Majaz	3	1,100	3	2,800	0	0	6	2	8
	Sehar	7	8,100	10	240,100	0	2	24	51	77
	TOTAL	**23**	**27,545**	**50**	**764,325**	**0**	**7**	**64**	**77**	**148**
Sana'a	Al-Haimah Al-Kharejya	1	1,200	2	3,000	0	0	1	0	1
	Al-Salfyah	5	8,520	8	230,600	0	0	32	23	55
	Arhab	5	12,870	15	84,700	2	0	30	29	61
	Bani Bahlool	13	25,800	31	3,162,900	0	0	101	95	196
	Bani Hushaish	7	26,100	16	39,970	2	4	39	42	87
	Bani Matar	5	5,380	12	872,250	0	0	38	53	91
	Bilad Al-Roos	3	2,520	8	4,784	0	0	19	10	29
	Khawlan	5	20,150	19	2,469,961	0	0	57	46	103
	Sanhan	3	7,000	3	453,000	0	0	17	9	26
	TOTAL	**47**	**109,540**	**114**	**7,321,165**	**4**	**4**	**334**	**307**	**649**
Shabwah	Al-Ain	1	150	2	3,900,000	0	0	0	0	0
	Armaa'	2	80	2	75,000,240	0	0	2	0	2
	Ataq	2	50	2	850,000	0	0	1	4	5
	Duher	1	50	1	10,800,000	0	0	0	0	0
	Nesab	2	7,350	2	375,000	0	3	0	0	3
	Ussailan	1	350	4	2,300,000	0	0	17	5	22
	TOTAL	**9**	**8,030**	**13**	**93,225,240**	**0**	**3**	**20**	**9**	**32**
Taiz	Al-Makha	1	500	1	1,250	0	0	1	3	4
	Al-Waze'yah	17	5,658	25	1,106,300	0	0	71	42	113
	Maqbanah	7	1,876	15	664,300	0	1	17	4	22
	Mawiah	1	350	1	1,000	0	0	2	0	2
	Shar'ab Al-Rawna	48	20,134	63	1,084,160	1	1	174	145	321
	Shar'ab Al-Salam	6	18,290	10	47,100	2	0	10	16	28
	TOTAL	**80**	**46,808**	**115**	**2,904,110**	**3**	**2**	**275**	**210**	**490**
	GRAND TOTAL	**592**	**827,794**	**1,078**	**922,726,881**	**57**	**121**	**2,503**	**2,223**	**4,904**

TABLE 30

DETAILS OF MINED AREA TERRAIN AND VEGETATION FOR HIGH-IMPACT COMMUNITIES

	Vegetation	Flat land only	Hillside, ridge and gully	Other	Total
Governorate: ABYAN District: KHANFAR Community: OWAYDAYN	None				
	Short grass only			6,000,000	6,000,000
	Tall grass, at least some				
	Bushes or trees, at least some			6,000,000	6,000,000
	Others				
Governorate: ADEN District: AL-BURAIQA Community: AL-HESWA	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some	160,000			160,000
	Others				
Governorate: AL-BAIDHA District: AL-ZAHER Community: LAJRADI AND AL-MIHSIN VILLAGES	None				
	Short grass only		132,500		132,500
	Tall grass, at least some				
	Bushes or trees, at least some		135,000		135,000
	Others				
Governorate: AL-BAIDHA District: MUKAIRAS Community: AL-MADMANAH AND AL-QHAZARI	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some				
	Others	80,000			80,000
Governorate: AL-DHALE' District: AL-DHALE' Community: AL-MASHARIH	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some		6,000,000		6,000,000
	Others				
Governorate: AL-DHALE' District: AL-DHALE' Community: QARADH	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some		250,000		250,000
	Others				

(continued on next page)

	Vegetation	Flat land only	Hillside, ridge and gully	Other	Total
Governorate: AL-DHALE' District: DAMT Subdistrict: RAKHAMAH Community: AL-OKRAH	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some		1,080,000		1,080,000
	Others				
S. No. 8 Governorate: AL-DHALE' District: JUBAN Subdistrict: HAJAJ Community: JABOOB KHOOLAH	None				
	Short grass only		30,000		30,000
	Tall grass, at least some				
	Bushes or trees, at least some		2,100,000		2,100,000
	Others				
S. No. 9 Governorate: AL-DHALE' District: QA'TABAH Subdistrict: AL-A'SHWOR Community: BAIT AL-SHOOKI	None				
	Short grass only		2,400,000		2,400,000
	Tall grass, at least some				
	Bushes or trees, at least some		2,924,000		2,924,000
	Others				
S. No. 10 Governorate: AL-DHALE' District: QA'TABAH Subdistrict: BLAD AL Community: UOBI AL-RIBI	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some		270,000		270,000
	Others				
S. No. 11 Governorate: AL-DHALE' District: QA'TABAH Subdistrict: BLAD AL Community: UOBI OWISH	None				
	Short grass only		6,359		6,359
	Tall grass, at least some				
	Bushes or trees, at least some		955,000		955,000
	Others				
S. No. 12 Governorate: HAJJA District: AL-SHAGHADERA Subdistrict: QAL'AT HAMEED Community: MAGHRABA BENIN	None				
	Short grass only				
	Tall grass, at least some				
	Bushes or trees, at least some		12,500		12,500
	Others	1,500			1,500
S. No. 13 Governorate: IBB District: AL-NADERA Subdistrict: HADDAH Community: MARSH	None				
	Short grass only		9,698,400		9,698,400
	Tall grass, at least some				
	Bushes or trees, at least some		5,011,200		5,011,200
	Others				

(continued on facing page)

Governorate: SANA'A
District: BANI HUSHAISH
Community: AL-JAFINAH

Vegetation	Flat land only	Hillside, ridge and gully	Other	Total
None				
Short grass only		1,500		1,500
Tall grass, at least some				
Bushes or trees, at least some		2,000		2,000
Others				

ALL HIGHLY IMPACTED COMMUNITIES

Vegetation	Flat land only	Hillside, ridge and gully	Other	Total
None				
Short grass only		12,268,759	6,000,000	18,268,759
Tall grass, at least some				
Bushes or trees, at least some	160,000	18,739,700	6,000,000	24,899,700
Others	81,500			81,500
Unknown				
TOTAL	**241,500**	**31,008,459**	**12,000,000**	**43,249,959**

Background&Methodology

Background&Methodology

Project Timeline

Initial planning for the Yemen Landmine Impact Survey began in the fall of 1998 and culminated in a completed survey report in July 2000.

The following timeline provides an overview of the process from conception to completion.

December 1998—***Advance Survey Mission***—Two members of the SAC staff—traveled to Yemen to meet with key government officials and representatives of some of the U.N. agencies and international NGOs. The Advance Survey Mission was led by Mr. Narinder Aggarwala, a retired senior program officer for UNOPS. The technical specialist was Mr. Sayed Aqa, the SAC Field Operations Director.

January 1999—***Funding Proposal***—Information and data obtained by the Yemen Advance Survey Mission were used to develop a revised country survey plan and proposal that were submitted to the U.N. Mine Action Service for funding. Canada contributed U.S.$971,364 to the United Nations Trust Fund to support a Landmine Impact Survey in Yemen.

Implementing Partner Selected—The survey was subcontracted for implementation through the SAC to the Mine Clearance Planning Agency. It was decided that the Survey Country Team would work closely with the National Demining Committee.

June 1999—***SAC Visit***—Sayed Aqa, SAC Field Director, and Richard Kidd, SAC Program Manager, visited Yemen and negotiated the terms of reference for the Survey Steering Committee. Final working relations between the MCPA team and the Yemen authorities were also clarified.

July 1999—***Agreements Signed***—A Memorandum of Understanding between Yemen and the United Nations was signed for the execution of the survey. Final contractual agreements for survey implementation were arranged between UNOPS and SAC and between SAC and MCPA.

August 1999—***MCPA Arrives***—The MCPA team of expatriate staff arrived in Yemen and began administrative functions related to opening an office, obtaining a bank account and registering with local authorities.

September 1999—***Local Staff Recruited***—Local staff members were hired and training was conducted for supervisors and field editors.

Testing—Pretest 1 was conducted to determine the utility and accuracy of the survey instrument. Assessment of supervisor/field editor candidates indicated that additional training was required to ensure mastery of the survey instrument.

October 1999—***Collaboration Meetings—***Project activities were coordinated with all relevant Yemeni government departments and organizations including the Ministry of Local Administration, the Central Statistics Organization, the Aden Regional Demining Office and Demining Training Center, and the National Technical Executive Unit. Regular Survey Steering Committee meetings provided an opportunity for effective coordination.

Administration/Logistics and Finance Training Workshop—Six members of the national staff from Yemen attended a workshop in Sana'a. Following the workshop, trained national staff assumed responsibility for survey administration and financial affairs under the supervision of MCPA expatriate staff.

Retraining Course for Field Supervisors/Field Editors—This session, conducted at the Demining Training Center in Aden, focused on the revised survey questionnaire, coding sheets, community mapping, a list of communities (Gazetteer), Geographic Positioning System (GPS), radios, and basic skills of supervision.

Revision of Survey Instrument—After revision in English, local staff translators and the MCPA Information Officer revised the survey instrument, coding sheets, and scoring sheet and translated them into Arabic.

Obtaining Maps and Data—The Yemen Gazetteer was received from the Central Statistics Organization and formatted to meet the needs of the Landmine Impact Survey.

Preparation for Pretest 2—Project staff secured administrative supplies, hired six vehicles, and identified governorates and districts to be surveyed during this test.

November 1999—***Recruitment of Enumerators—***Thirty-seven Yemeni citizens were recruited and trained to serve as survey enumerators. Arrangements for training were coordinated with NTEU at Sana'a/Aden and the Aden-based Demining Training Center.

Pretest 2—The retrained supervisors and field editors were deployed to the field to conduct actual survey operations, testing their understanding of the survey instrument and the soundness of the methodology.

Expert Opinion Collection—Information was collected from the Ministry of Local Administration, NTEU, other Ministries/government departments, NGOs, and district-level Survey Team visits. Firsthand information confirmed that, of the 19 governorates, 15 were affected by landmines to varying degrees.

December 1999—***A Yemen/Mozambique Survey Coordination Meeting*** was held in Geneva, Switzerland. Participants from SAC, MCPA, Canadian International Demining Centre (a group implementing a survey in Mozambique), the Geneva Centre for Humanitarian Demining (GICHD) and UNMAS discussed experiences during survey operations and shared lessons learned.

January–February 2000—***Yemen Pilot Survey***—Enumerator teams conducted and completed a pilot survey in 22 of the 126 mine-affected districts. This included completion of the survey operations in the entire governorate of Aden and 17 districts in other governorates. The pilot survey did not experience any major operational or administrative problems. Full-scale village-level data collection commenced on 17 February in 14 governorates

As a part of the coordination with SAC, Mr. Joe Donahue, Operations Officer at SAC, visited Yemen during the period 7-16 February 2000 to monitor field operations and participate in the evaluation workshop of the pilot test survey and operational review of the project.

Replacements for lost equipment including one laptop and one desktop computer and three digital cameras, as well as additional equipment required for the project including 25 digital cameras, 16 GPS units and one A0-size plotter arrived at Sana'a airport.

March 2000—The project focused on village-level data collection. As of 14 March, the project completed data collection in 44 districts of the 128 reported affected districts by visiting more than 700 reported mine-affected communities. This included the entire governorates of Aden and Al-Mahra.

April 2000—As of the end of April, 940 of the 1,300 reported communities in 78 affected districts, representing nine out of the 18 affected governorates had been visited and initial analyses of the collected data began. In addition, the survey teams visited approximately 1,000 communities in 52 districts as part of the procedure for sampling for false negatives.

Mr. Guy Rhodes, the Norwegian People's Aid (NPA) Team Leader for the Landmine Impact Survey in Thailand, visited Yemen during the period 18-20 April for exchange of views and opinions on the MCPA's experience in Yemen.

MCPA received the new version of IMSMA, and commenced recoding and entry of data into the new version.

May–June 2000—Village-level data collection was completed on 7 June 2000. Field staff was released effective 11 June. Data entry, initial analysis of data, and work on the final survey report continued during May. Draft results and initial findings of the survey were shared with government stakeholders, national mine action organizations and the United Nations/Nongovernmental Organization (NGO) community for discussion and input.

Richard Kidd, SAC Program Manager, was accompanied by Tim Lardner, Mine Action Program Officer, Cranfield University (United Kingdom) during a Mid-cycle Review visit to Yemen during 8-10 May. In addition to meeting with the Minister of State for Cabinet Affairs, Kidd met with United Nations and NTEU officials regarding implementation of the Landmine Impact Survey in the Republic of Yemen.

Rune Engeset, Norwegian People's Aid (NPA) Operations Officer for the Landmine Impact Survey in Thailand, visited Yemen during the period 28-31 May to exchange views regarding the survey and to learn from the MCPA experience in Yemen.

The MCPA Aden office was closed during the last week of May.

July–August 2000—To facilitate completion of the survey and production of the draft report, SAC deployed three staff members to Yemen during July. These were Sayed Aqa, SAC Field Director; Dr. Aldo Benini, Social Scientist; and Chuck Connelly, Information Management Officer.

The draft final report was presented to the government of Yemen for review in the middle of July. This report, along with the government's comments and a report by the UNOPS QAM was provided to UNMAS to support the certification process. The full Impact Survey Certification Committee met on 21 August and, after reviewing the documentation, certified the survey without qualification or reservation.

At the request of the government of Yemen, the Survey Action Center along with MCPA and Cranfield University Mine Action agreed to undertake a "Survey Utilization Project" to demonstrate exactly how survey results can be incorporated into a mine action strategic planning process.

Key Participants

The Landmine Impact Survey in Yemen was very much a collaborative effort that required the support and involvement of a wide range of organizations including government bodies, the International Donor Community, the United Nations and various Nongovernmental Organizations.

- Yemeni National Demining Committee (NDC) is the senior Yemeni government mechanism for mine action policy, strategic planning and implementation. The NDC Committee is chaired by the State Minister for Cabinet affairs and includes representatives .

- National Technical Executive Unit (NTEU) is a Yemeni government body designated to manage and execute mine action activities in Yemen. The NTEU is the intended local customer and future custodian of collected data from the Landmine Impact Survey.

- Government Ministries and Departments: At the request of the NDC, a wide array of Yemen government bodies assisted the survey, including the office of the Prime Minister, the Ministry of Local Administration, the Ministry of Education, the Ministry of Information, the Ministry of Planning, the Ministry of Health, the Ministry of Defense, the Ministry of the Interior and the Ministry of Finance.

- The Survey Action Center (SAC) is a Washington, D.C.-based nonprofit organization affiliated with the Vietnam Veterans of America Foundation. SAC provided overall management of the Yemeni Landmine Impact Survey, technical expertise to support the work in the field and coordination between the Yemen survey and other international survey efforts.

- Mine Clearance Planning Agency (MCPA) is a nonprofit organization based in Afghanistan that has been a pioneering organization in the realm of minefield surveys. MCPA, under contract through SAC, was responsible for the execution and management of the survey activities taking place in Yemen.

- United Nations Mine Action Service (UNMAS) a body within the United Nations Department of Peacekeeping Operations (DPKO) serves as the focal point for mine action within the United Nations system in the areas of policy and overall coordination. UNMAS selects the countries to undergo impact surveys, manages the process of survey certification and assists in resource mobilization.

- United Nations Office for Project Support (UNOPS) is the contracting and project management body within the United Nations that is responsible for administering SAC's contract in Yemen on behalf of the United Nations Mine Action Service.

- United Nations Development Program (UNDP) is the U.N. agency responsible for developing and supporting local mine action capacities, normally accomplished through a technical advisory team. In Yemen, the Chief Technical Advisor, Mr. Phil Lewis serves as the primary liaison between the MCPA team and United Nations mine action organizations.

- U.S. Humanitarian Demining Program is managed by the United States Department of Defense. This agency established a national demining training center near Aden, provided training to Yemeni nationals to carry out demining activities and provided support to the survey by sharing facilities, expertise and equipment with the MCPA team.

- Mine Awareness Association: A Yemeni educational organization carried out mine awareness activities in three southern governorates and supported the survey through the sharing of information and some staff.

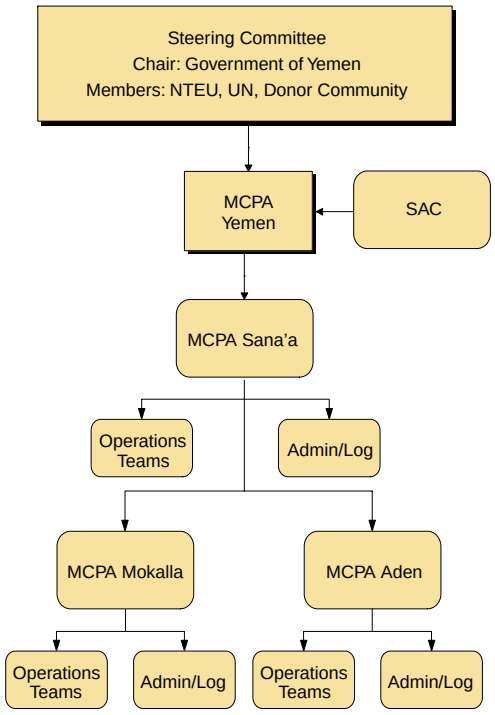
- International Campaign to Ban Landmines (ICBL) established an office in Yemen during the course of the survey and is reporting on Yemen's compliance with the "Convention on the prohibition and of the use, stockpiling, production and transfer of antipersonnel mines."

Administrative Structures

Local Partnerships: The Landmine Impact Survey was organized under the independent management of SAC in full consultation with the Yemeni National Demining Commission and the National Technical Executive Unit. The ministries of Defense, Education, Local Administration, Information, and Health cooperated with SAC staff to help plan and implement project activities. For example, the Ministry of Education identified unemployed teachers who could work as enumerators. The Ministry of Local Administration helped with expert opinion collection; the Ministry of Information offered free radio broadcasts to inform Yemeni citizens about the survey; the National Technical Executive Unit provided maps and other information.

FIGURE 11

IN-COUNTRY IMPLEMENTATION STRUCTURE



Survey Offices: The SAC Advance Survey Mission identified 13 governorates affected by mine contamination in Yemen and grouped them into six general areas of contamination: one in the North, two in the South and three in the East. It was decided to create regionally based teams of supervisors, field editors, and enumerators. The main survey project office was located in Sana'a, with offices in Aden and Al-Mukala. The in-country implementation structure is reflected in Figure 11.

Project Staff: This group included four permanent international staff members of MCPA and 102 Yemeni nationals. Qadeem Khan Tariq, a member of the Mine Clearance Planning Agency, served as Project Leader in Yemen. Two-person enumerator teams collected data, and between three and five such enumerator teams reported to one field supervisor. Working alongside the field supervisor was the field editor. The distinction between the supervisor and editor positions is that the supervisor manages the operational activities of the teams, while the editor ensures the accuracy and correctness of the data.

- Technical Advisory Team: SAC provided specialists in the areas of social science methodology, survey design, geographic information systems, and statistics as required to assist work being done in Yemen and to conduct analysis of results.

- Quality Assurance Monitor: UNOPS staff member, Justin Brady served as the full-time quality assurance monitor (QAM) for the Yemen Landmine Impact Survey. In this capacity he used the UNMAS Impact Survey Certification Guidelines to monitor and document the progress of the survey. The QAM developed processes and presented instruction during the training of survey staff related to quality control and assurances activities and resurveyed 18 communities in 10 districts to verify survey results.

Finances

BUDGET AND EXPENDITURES

The budget for the survey was developed following the SAC advance mission and included a large amount of nonexpendable equipment intended to support the NDC once the survey was completed. The initial budget for the SAC and MCPA portions of the survey was projected to be U.S.$1.4 million. This amount was revised downward in January 2000, and further savings during the course of the survey brought the total to just under $1,100,000. Additional funds were spent by the United Nations to support general coordination of the survey, grant management, and quality assurance functions.

MCPA (survey)	$968,000
SAC (technical support)	$102,000
UN (QAM and equipment)	$575,000
Total[7]	**$1,645,000**

FUNDING MECHANISMS

Funding for the Yemen survey was provided by donations received from the governments of Canada, Norway, Germany, and Japan through the United Nations Voluntary Trust Fund for Mine Action. The government of the United States provided funds through the United Nations Fund for International Partnership (UNFIP), receiving a one-third match by the United Nations Foundation.

Funds for the Landmine Impact Survey in Yemen were provided by the following:

Government of Canada—UNMAS	$971,000
Government of Japan—UNMAS	$450,000
Government of Germany—UNMAS	$100,000
U.S. Department of State—UNFIP	$68,000
U.N. Foundation—UNFIP	$22,000
Total[7]	**$1,611,000**

In addition to the amounts listed above, the MacArthur Foundation provided financial support through the SAC to conduct the advance survey mission, and the U.S. government has paid SAC core costs related to international coordination and training conducted in support of the survey.

[7] All figures in U.S.$.

Yemen Methodology

SURVEY METHODOLOGY IN YEMEN

The survey in Yemen followed the standard SAC practices of engaging in the systematic collection and analysis of "expert opinion" to determine the locations of communities likely to be impacted by landmines and UXO. The "Community Interview" with its associated component activities of interviewing, mapping and visual verification was then conducted in all contaminated communities. The results of the community interviews were entered into the IMSMA database, which formed the basis for subsequent analysis. A more comprehensive explanation of the standard survey methodology may be found in the *Global Landmine Survey* report.

Yemen is both a Muslim and a tribal society. Special care was taken to ensure that survey enumerator teams did not offend local sensitivities or customs. Teams generally recruited from the regions where they would work. In some cases, female enumerators were included in the teams to facilitate access to women in the community.

Expert opinion and site selection

Soon after the MCPA team arrived in Yemen, it began, with the help of responsible government authorities, collecting information regarding governorates and districts that were likely to be mine contaminated. Expert opinion collection in Yemen was initially coordinated through the Ministry of Local Administration. Expert opinion questionnaires were sent to governorates suspected of landmine/UXO contamination. The Ministry obtained reports of approximately 400 mine-affected communities in nine governorates. In addition, a number of national and international NGOs were polled, and input from the public was solicited through an information campaign over national television and radio. However, the list of affected communities reached approximately 1,200 once the MCPA-trained Yemeni field staff visited all district centers within the affected governorates. Other communities during the survey indicated approximately 100 additional communities.

As is standard of the survey methodology, all communities that were suspected of suffering landmine or UXO contamination were visited and, if the contamination was confirmed, were surveyed. In addition, a sampling method adapted from quality assurance practices was used to test for false negatives among communities not suspected. False negatives were rare; experts in Yemen were more likely to generate false positives, designating a number of communities as potentially mine-affected, that were found to be mine-free upon further investigation.

Selection of communities for false negative sampling was made according to the "Landmine Impact Survey Sampling Protocol for High Coverage." As there are

no detailed maps available in Yemen to show the locations of all communities in a district, the Yemen Gazetteer was used to provide the sampling pool. The gazetteer is a list of communities in alphabetical order with coordinates at the district and subdistrict level. This procedure ensured wide geographical coverage of the control effort. On average, 18 communities were visited in each affected district. If any community sampled for false negatives or pointed out during the visit circuit were found to have landmines, it was surveyed. In addition, the initial expertise that classified the nearby communities as mine-free was rejected, and the nearby areas were searched for affected communities. If in the process, more false negatives were detected, the areas around each of them were also searched. The size of the area to be searched depended largely upon population density. The search area was one of the following areas, preferably the largest of the three:

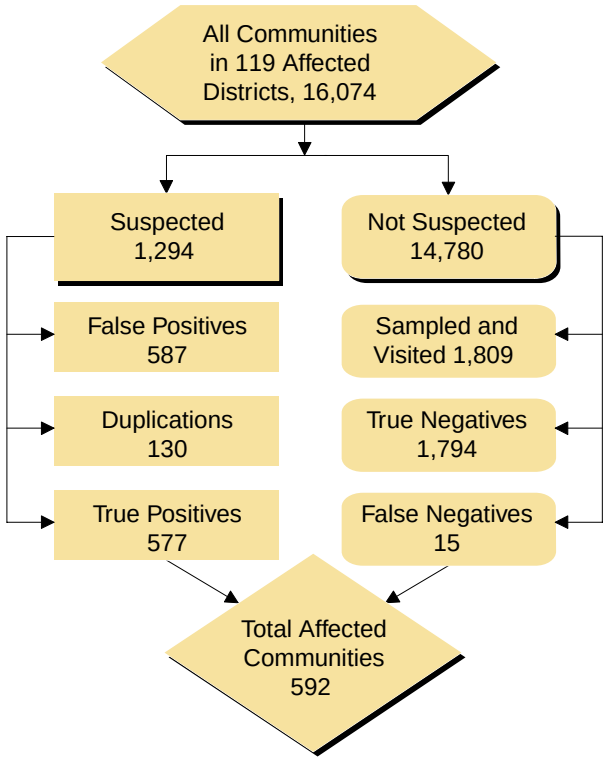
- All communities within five kilometers of an affected community,
- The five nearest communities,
- All communities, if practical, within the area circumscribed by the four other closest sampled-and-found-negative communities.

In total, 1,809 communities were visited for the control of false negatives in 100 affected districts, and 15 false negatives were found.

As for the suspected communities, all 1,294 of them in 119 affected districts of 18 governorates were visited. Among them, 592 were found to be affected by landmines or UXO, 587 were false positives and 130 were duplications in names or were names of mined areas. The results of the expert opinion are reflected in Figure 12.

FIGURE 12

RESULTS OF EXPERT OPINION COLLECTION



THE TOTAL VISIT AND SURVEY EFFORT

The total visit and survey effort was considerably larger than the mere number of affected communities suggests. This is graphically expressed for a section of the country in Map 4 on page 70, in which the red dots (affected communities) are outnumbered by the green dots (false positives) and blue dots (negatives in the control sample).

The demographics of community interviews

In the 592 communities surveyed, a total of 5,914 key informants were recorded in the group interview attendance sheets. The vast majority were men in their active age. Despite focused efforts to broaden involvement, only 59 participants were women. Most participants (4,987) were from the ordinary ranks of the communities—e.g., laborers, farmers, students, low-level government employees, small business owners. On average, however, more than one higher-status representative would be present (772 in total)—sheikhs, army officers, headmasters, higher-level government officials. The number of recorded participants ranged from one to 18, with 10 being the median number.

No fewer than 134 of the participants described themselves as survivors of mine accidents.

However, in 73 communities, separate meetings with small numbers of women were held after the key informant meetings. A total of 511 women took part in these meetings, which were conducted by female enumerators. A special questionnaire, abbreviated from the basic one, was used.

The discussions with the women revealed that male key informants tended to exaggerate the number of victims of old date and the number of animals killed by mines. The women, who are the ones tending the animals, used much more conservative counts or estimates.

Male informants in many communities also neglected to mention that the mines endangering those who went out to collect fire wood. This is mainly a female task. Data on blocked wood gathering areas—in Yemen, this is mostly shrubland, not dense forest—is therefore likely very incomplete.

Community interviews

All communities suspected of landmine or UXO contamination were visited, usually by a field supervisor who would explain the purpose of the visit to the community. If the community were found to be affected, the field supervisor would set an appointment for a team of two enumerators to meet with a group of key informants, usually five or more gathered from a cross-section of socio-economic backgrounds. If the community were found unaffected, a false positive form would be completed and there would be no subsequent survey visit.

An enumerator team usually surveyed a community for a day, much of which was spent interviewing key informants. The remainder of the enumerators' time in the locality was spent interviewing other knowledgeable persons not present at the group interview, conducting visual verification of individual mined areas from safe viewing points, and clarifying unresolved questions in a final talk with the chief of the locality.

The group interview consisted of two parts: a community mapping session and a structured questionnaire interview. The enumerators requested that key

informants sketch the outline and important landmarks of the locality, major roads and *waadis*, and the mined areas on a large (A1 size) sheet of paper. In most cases, however, the enumerators did the sketching, with assistance from some of the key informants. The map helped the enumerators and informants communicate more effectively regarding the various mined areas in the community during the interview.

The questionnaire contains four modules that mirror the structure of the relational database that stores the information. The modules are further subdivided into segments that anticipate the logical flow of conversation. The modular structure of the questionnaire is given below.

The modules and segments of the community interview questionnaire

Community-level module—Part 1

Segment 1: Identification
Segment 2: Certification
Segment 3: List of attachments and checking
Segment 4: Background observations on this community
Segment 5: Introduction
Segment 6: Community mapping and mined areas summary
Segment 7: Historical context
Segment 8: Total victim numbers

Mined-area module (one for each mined area)

Segment 9: Reference point, description and size
Segment 10: Marking, terrain, suspected ordnance
Segment 11: Impact
Segment 12: Verification from a safe point

Individual victim module (one for each recent victim)

Segment 13: Victim descriptors
Segment 14: Accident and consequences

Community-level Module—Part 2

Segment 15: Victims of less recent date
Segment 16: Mine action
Segment 17: End of the meeting
Segment 18: Observations after the meeting

Meeting attendance sheet

The village mapping and questionnaire interview generally took about one and one-half hours, but sometimes as long as three hours or more, depending upon the number of mined areas and recent victims.

After the group interview with the key informants, the enumerators would generally separate. One enumerator, along with guides from the community, verified the claimed mined areas from safe viewing points. The enumerator noted the distance and direction to the mined area edge, took a GPS reading and a digital photo of the mined area. In addition, he or she would verify the information provided by the community about the size, vegetation, and land type of the mined area. The other enumerator remained in the village to meet with other informed persons. Female enumerators usually held an informal discussion with some of the local women to get their inputs to the survey. Before leaving the village, the enumerators would speak with the community leader once more to clarify any remaining questions. The leader signed the questionnaire as proof that the survey had taken place.

FIELD EDITING, DATA ENTRY, AND ANALYSIS

Upon return to temporary quarters, enumerator teams handed over the completed questionnaires, village maps, sketches from the visual verification, notes from meetings with women and all other documentation to a field editor. Pictures of the mined areas, community interview, and any mine victims were downloaded from the digital cameras in the respective regional offices at the end of each three week field mission. As a quality control measure close to the source of the information, the editor checked the material for consistency, completeness and legibility. He or she transferred the information from the Arabic-language questionnaire to English-language coding sheets. These sheets systematized the translation process and facilitated later data entry.

At the end of the week, all the enumerator teams met with their field supervisor and field editor. Here, they reviewed the completed surveys and assigned each community a code from the official Yemen Gazetteer as well as a score representing the level of socio-economic impact from mine contamination. These weekly meetings also provided an important peer-group check on the work before the documentation was sent to the MCPA regional offices in Aden and Al-Mokalla and to the head office in Sana'a for data processing. Before the group left a district, they drew a map showing the distribution of affected and mine-free communities in order to visualize the spatial distribution of their work and to discover any areas possibly left out. In addition, the team briefed the local authorities in the district to share with them the result of the survey.

After the documentation was rechecked in the regional offices, it was sent to MCPA Sana'a. Here, a data entry person checked it for completeness and then registered it. Six national data processors entered the data into the IMSMA database. The MCPA Data Manager checked their work and authorized modifications in a password-protected computer network. The hard and electronic copies of the sur-

veys received a special identification number for easy reference. The hard copies were stored in folders for archival purposes.

When the data entry was completed for the entire survey, a copy of the data pool was shared with the Survey Action Center in Washington, D.C. SAC and MCPA staff members collaborated in the final analysis and presentation of the results.

A Case Study: Al-Thud Village in Ibb Governorate

Al-Odain District is located approximately 60 kilometers to the west of historic Ibb city. Al-Thud is a small village with nearly 300 people located on a hilltop in the far south of the district. It was one of the villages in Al-Odain that was flagged as mine-affected when MCPA survey teams were collecting expert opinion about affected communities in late 1999. On 8 May 2000, the field supervisor responsible for the two enumerator teams in Al-Odain, Mr. Ali Obadi, visited the village. The people from the village confirmed the mine contamination in their community, and an interview was arranged for two days later.

Community-mapping activity

The interview was assigned to Mr. Abdul Qawi and Ms. Shafiqa, one of the few mixed male-female enumerator teams. Although Al-Thud is only about 12 km from the district center, the road was so bad that the team took more than one hour to drive there. The sheikh, Mr. Abdul Samad Abdullah Al-Garafi, along with four farmers and two teachers from the village, was awaiting the team. The villagers welcomed the team with refreshments served in a classroom at the village primary school, where the interview was to take place.

Mr. Qawi made a formal start by introducing MCPA, the objectives of the survey, and the day's program, which would include community mapping, the interview process, and visual verification of any mined areas. He hung an A1-sized paper sheet on the wall and asked about major landmarks in the community, and about location and direction of the mined area. In the meantime, Ms. Shafiqa requested that one of the teachers fill in an attendance sheet for the interview participants. Several of the attendees came forward to contribute to the sketch map. They conferred among themselves before one of them indicated the direction, distance, and size of the mined area–it turned out there was only one. The pattern of group discussion preceding verbalization of answers to the enumerators was respected throughout the questionnaire part of the interview.

(continued on next page)

The finished community map with one mined area.

When the map was finished, Ms. Shafiqa began to administer the questionnaire. Meanwhile, Mr. Qawi left to take a GPS reading at the yard of the village primary school which served as the community reference point. He returned to take the photo of the key informants in action and then helped Ms. Shafiqa complete the interview. This lasted for about an hour and a half because there was only one mined-area module to fill in, and no recent-victim module was needed. However, the team learned that, not so recently, a girl lost her leg in a mine explosion.

As in most places in Yemen, the group interview was remarkable for the friendliness of the local people. In this spirit, two well-informed persons volunteered to take Mr. Qawi to a safe spot from where he could see the mined area. The safe spot was a hilltop area some 100 meters east of the village center.

The mined area was located on a hilltop about 1,700 meters southeast of the village center. It blocked access to a natural water reservoir. Mr. Qawi reckoned that it comprised approximately 20,000 square meters. However, the impact relative to its size was significant. The village once depended upon the reservoir for drinking and irrigation water before it was mined in 1982. The community has suffered water shortages ever since. An alternative for the main water source has not been found. From his vantage point, Mr. Qawi completed the mined-area module, drew a sketch map, and took a GPS reading and photos.

Ms. Shafiqa took advantage of that time to find women willing to talk about the mines. The women confirmed what the men had said in the meeting about both the presence of mines and their impact upon the community.

Around 11:30 am, two and a half hours into their visit, the enumerators joined the sheikh again in the schoolyard. He signed off on the questionnaire and, receiving the team's gratitude, let them leave for Al-Odain. There, in the staff's temporary quarters, the field supervisor checked the questionnaire. The field editor did the same before completing the English-language coding sheets. Later, the documentation was sent to the MCPA Sana'a office for data entry.

COMMUNITY CASE STUDIES

After the data collection was completed in June 2000, a small number of community case studies in the affected communities were done. There were several objectives:

- To balance the statistical nature of the survey with more personalized testimony from members of affected communities
- To recheck some of the key information that the enumerator teams had collected
- To visualize the situation of those communities in terms of the contamination history and subsequent initiatives by community members and authorities to improve it

Communities were selected to represent a range of impact categories, population sizes, and locations. Eventually, six communities were visited. One community had to be replaced late in preparations because fighting had broken out there.

Initially, MCPA had wanted to commission outsiders to do these studies. However, qualified candidates could not be engaged, and the choice fell on four former field supervisors and enumerators (three men and one woman) who had been noted for their good Arabic writing skills. They formed two teams for the purpose.

The teams received briefings as well as written guidelines. The first study by each team was considered a pretest and was critiqued in a review session in Sana'a. The teams were equipped with digital cameras and handheld GPS units. They spent a minimum of two days in each community, interviewing a cross-section of community members and meeting also with mine accident survivors. In five out of the six cases, MCPA was able to send the teams to communities outside the former data collection areas of their members.

Translations of the Arabic study reports were outsourced and then edited by MCPA.

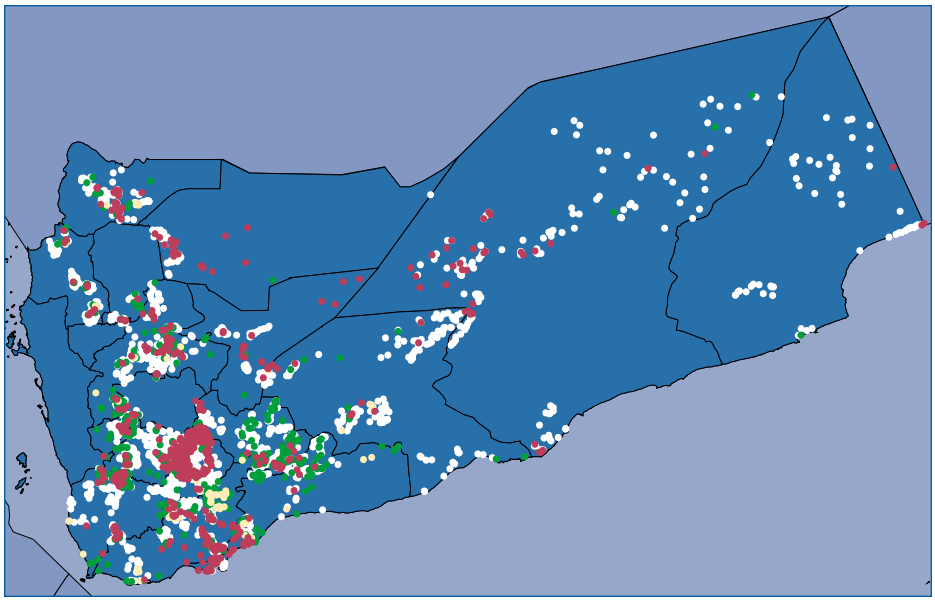
Three of the case studies are appended. Some of the material has been used for sidebars in the main body of the report.

The studies shed light on many factors that made each of these six situations unique. The information collected by the enumerators proved correct to a high degree. In one community, a difference was noted in the number of recent victims, and the community was reclassified from high impact to medium impact.

MAP 4

COMMUNITIES VISITED DURING THE LANDMINE IMPACT SURVEY

- Communities sampled and confirmed mine-free
- Communities reported and confirmed mine-affected
- Communities reported and confirmed affected by a single UXO
- Communities reported but confirmed mine-free (false positive)



Attachments & Supporting Documentation

Attachments & Supporting Documentation

Supporting Analysis

COMBINATIONS OF IMPACTS

The Landmine Impact Survey assigned affected communities to five different categories (plus one residual category) depending on the kinds of blockages that the communities suffered.

The statistical procedure used to create these types is K-means cluster analysis. The manual of SPSS, the statistical software used, explains it as follows:

> *This procedure attempts to identify relatively homogeneous groups of cases based on selected characteristics, using an algorithm that can handle large numbers of cases. However, the algorithm requires you to specify the number of clusters.*

In this event, the number of clusters was determined by trial and error. We settled for six clusters when it appeared that the choice of more clusters would result in some that had very few members.

TABLE 31

SIX-MEANS CLUSTER ANALYSIS

Final cluster centers

Variable	Cluster					
Cluster number given by SPSS	1	2	3	4	5	6
Irrigated farms	0.00	0.00	0.43	0.00	0.07	1.00
Rain-fed farms	0.48	0.27	0.17	0.20	0.14	0.19
Pasture	0.93	1.00	0.91	0.85	0.00	0.95
Wood foraging	0.19	0.20	0.17	0.10	0.02	0.29
Drinking water	0.81	0.00	0.91	0.00	0.02	0.00
Water, other purposes	0.96	0.00	1.00	0.03	0.00	0.10
Housing	0.07	0.01	0.09	0.07	0.16	0.05
Roads to administrative centers	0.15	0.02	0.04	0.08	0.12	0.05
Local roads and trails	0.00	0.00	0.87	1.00	0.00	0.29
Cluster name used in report	C	A	D	B	F	E
Number of communities in the cluster	27	376	23	102	43	21

Table 31 presents the so-called final cluster centers of the statistical output. The letter used to characterize the impact combination type and the number of communities in the cluster is also shown. The figures in the cells mean the percentage of the communities in a certain cluster who shared a particular trait. For example, 48 percent of all communities in Cluster 1 experienced blocked access to some of their irrigated land.

The variance analysis table (Table 32, next page) is also included. This supplementary routine examines how well the frequency of traits discriminates between clusters. As noted in the main body of the report, rain-fed farms, wood foraging, housing and roads to administrative centers are not very strongly associated with any of the types. This can be seen in this table by their low F-values. However, the low value for wood foraging may be the result of systematic underreporting by male key informants, who often neglected to mention mine problems in areas important for this women-led activity.

TABLE 32

SIX-MEANS CLUSTER ANALYSIS

ANOVA

Variable	Cluster mean square	df	Error mean square	df	F	Sig.
Irrigated farms	4.72	5	0.01	586	327.67	0.000
Rain-fed farms	0.52	5	0.18	586	2.82	0.016
Pasture	7.77	5	0.03	586	261.45	0.000
Wood foraging	0.44	5	0.14	586	3.09	0.009
Drinking water	6.74	5	0.01	586	501.67	0.000
Water, other purposes	8.68	5	0.01	586	894.63	0.000
Housing	0.22	5	0.04	586	5.78	0.000
Roads to administrative centers	0.17	5	0.04	586	3.91	0.002
Local roads and trails	18.69	5	0.01	586	1588.24	0.000

COMMUNITY BACKGROUND AND MINE ACCIDENTS

Models were investigated to relate the differing number of recent mine victims in the affected communities to community background variables.

In the main model, the simple fact was considered whether a community had had any victims in the last 24 months prior to the survey or not. Some supplementary analysis was done looking at the exact number of recent victims.

The number of accidents in a given community may vary from one time period to the next. Therefore we are dealing with a phenomenon of sampling variance. Although a full enumeration was done of all affected communities, the accidents of the recent two years are only one sample realization of the underlying landmine hazard. This hazard, unless eliminated, will operate in many more (past and future) time periods, with variable outcomes. This variance justifies the use of significance tests for the model coefficients.

The first model has the disadvantage that it does not use the information on multiple accidents in a community that may have occurred during the sampled period. However, it avoids two complications: first, that the number of victims per accident is itself a randomly distributed variable; and second, that it is not always well remembered if victims are from a single accident or distinct accidents. The advantages and disadvantages for the second model are the opposite of those for the first model.

Dependent variables

Seventy-eight out of the 592 affected communities suffered one or several mine accidents in the past two years. From these, 178 persons came to harm. The distribution of recent victims per community is shown in Table 33.

The outlier—the one community with 22 victims, a UXO accident—was excluded from the second analysis.

TABLE 33

DISTRIBUTION OF RECENT MINE VICTIMS

Recent victims in the community	Communities with this number of victims	Percentage of all affected communities
0	514	86.7%
1	39	6.6%
2	23	3.9%
3	5	0.8%
4	4	0.7%
5	1	0.2%
6	1	0.2%
7	3	0.5%
8	1	0.2%
22	1	0.2%
TOTAL	**592**	**100.0%**

Explanatory variables

Table 34 shows the concepts and variables used in order to attempt to provide some explanation for the tendency of any given community to have mine accidents.

TABLE 34

EXPLANATORY DOMAIN

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 center of community
	Years since mines last laid
	Distance to nearest (other) community with some recent mine victims
Institutional endowment	Degree of institutional modernization
	Degree of technical modernization

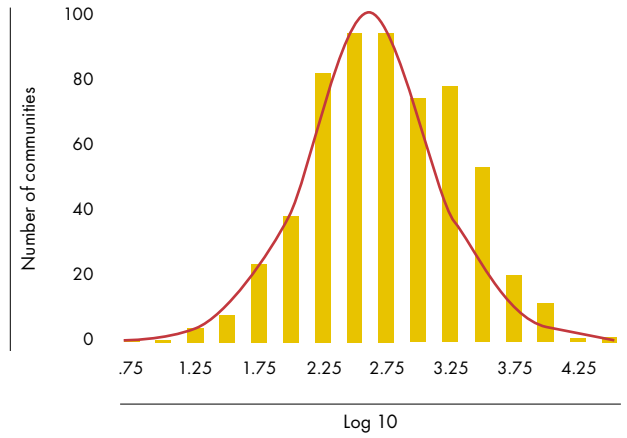
The variable "Distance of nearest mined area to center of community" was used only in the analysis of the number of recent victims, not in the main model concerning the occurrence or nonoccurrence of some accident. "Population size" was used, in some of the analyses of the second type, to create rates with the number of victims, not as an explanatory variable.

Two variables concern the modernity of the communities. They measure the degree of institutional modernity, respective of technical modernization. Technically, those are measured by way of the scores that the communities were assigned on two factors extracted from eight community background variables. The factor analysis will be detailed further below.

The distributions for several of the independent variables are extremely skewed. However, some of them closely follow a lognormal distribution. This means that their logarithm, a measure of magnitude, approximates the bell-shaped normal distribution.

FIGURE 13

LOGARITHM OF POPULATION



Std. Dev = .59 Mean = 2.75 N = 591.00

This normal distribution is demonstrated, by way of example, for the population size. In Figure 13, the bell curve is superimposed on the empirical data. The mean of the population-size logarithms is 2.75, which corresponds to a population, in absolute terms, of 562. A similar curve was shown, on page 14 of this report, for the distribution of mined areas by their estimated surface.

The parameters for that and the other explanatory variables are given in Table 35, except for the modernization variables, which will be explained separately.

The skewness of the logarithmically transformed variables is very low, a sign that the transformations were warranted for the purposes of regression modeling. "Blocked access to water" is a binary variable.

TABLE 35

DESCRIPTIVES OF SOME OF THE EXPLANATORY VARIABLES

	Current population (log 10)	Access to some water source blocked	Estimated mined area surface (log 10)	Distance to nearest mined area (log 10)	Years since mines planted	Distance to nearest town w/ recent victims (log 10)
Number Valid	591	592	592	592	591	592
Number Missing	1	0	0	0	1	0
Mean	2.7491	0.0962	4.9244	2.8515	17.96	0.9396
Median	2.699	0	4.942	2.8588	18	0.8473
Std. Deviation	0.592	0.2952	1.1662	0.4836	9.1	0.5609
Skewness	-0.009	2.744	-0.192	-0.237	0.324	0.389
Kurtosis	-0.04	5.549	0.033	0.858	-0.612	0.126
Minimum	0.78	0	0.85	1.18	1	-0.93
Maximum	4.6	1	7.91	4.39	38	2.78

Factor analysis of community institutions

During surveys, information on eight variables assumed to gauge the institutional complexity of the affected communities was collected. It was factor-analyzed in order to find underlying common factors. Table 36 groups the eight variables by their association with the two strongest factors.

The manual for SPSS, the statistical application in which this analysis was conducted, explains factor analysis as follows:

> *Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Factor analysis can also be used to generate hypotheses regarding causal mechanisms or to screen variables for subsequent analysis.*

TABLE 36

VARIABLES AFFECTING INSTITUTIONAL COMPLEXITY

Variable	Percentage Reporting	Rotated component matrix	
		Factor 1	Factor 2
Has secondary school	15%	0.75	0.09
Is ordinary village	90%	-0.72	-0.10
Has health care facility	17%	0.69	0.21
Has primary school	56%	0.59	0.06
Fuel is available	11%	0.47	0.47
Has telephone service	9%	0.21	0.66
Has piped water supply	19%	0.06	0.76
Has electricity	24%	0.06	0.80
Variance explained		36%	16%
Correlation with log of current population		0.48	0.32

The figures in the grayed areas are the factor loadings of the variables in a principal component analysis. The loadings express how closely the variables are associated with the factors. In the model, however, major use is made of the factor scores, which express how high or low a community is located on a factor. The factor scores are positively correlated with population size, which is an expected result; cities tend to have more complex institutions than villages do.

However, it must be stressed that the characterization of the first factor, as the "institutional modernization" factor, and that of the second, as expressing "technical modernization," is an arbitrary interpretation. This is evident particularly in the variable "Vehicle fuel is available in the community," which is shared between both factors equally. Nevertheless, these categories seem useful to the extent that the variables of the first factor are more closely linked to the presence of government officials, and the second is linked with services that are at the technical base of diverse social and economic activities.

Logistic regression of the mine accident risk

A binary logistic regression model was run to estimate the contributions of several assumed risk factors to the probability that an affected community has some mine accident in a two-year period, based on data for the last two years prior to the survey. The variables have been described above.

Table 37 is sorted by ascending observed significance levels (the smaller the level, the stronger the assumption that this variable indeed contributes).

TABLE 37

REGRESSION RESULTS ON COMMUNITY AND RISK FACTORS

Community had some recent mine accident or not

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
Distance to nearest other town with recent victims (log 10)	-0.7508	0.2424	9.5940	1	0.0020	-0.1284	0.4720
Technical modernization	-0.4238	0.1554	7.4354	1	0.0064	-0.1086	0.6545
Access to some water blocked	0.7376	0.3478	4.4986	1	0.0339	0.0736	2.0909
Years since mines were planted last	-0.0305	0.0171	3.1858	1	0.0743	-0.0507	0.9700
Total estimated mined area surface (log 10)	0.2111	0.1208	3.0543	1	0.0805	0.0478	1.2350
Current population (log 10)	0.3990	0.2776	2.0665	1	0.1506	0.0120	1.4904
Institutional modernization	0.0786	0.1564	0.2525	1	0.6153	0.0000	1.0818
Constant	-3.0405	1.0400	8.5477	1	0.0035		

2 Log Likelihood: 425.006; Goodness of Fit: 617.757; Cox & Snell - R^2: 0.059; Nagelkerke - R^2: 0.109

As is obvious from the low Pseudo-R2s, the performance of the model for classification and prediction is poor. However, it performs strongly on identifying significant covariates of mine accidents. These latter findings were used in the main body of the report. Since the Bs are unstandardized coefficients, and this standardization is tedious in logistic regression, the correlation coefficients (the Rs) were used to show the influence of these various factors. The last column [Exp(B)] holds the "odds" ratio for having some accident if the value of the explanatory variable is increased by one. "Odds" is a concept with which many readers may be more familiar than with correlation. However, these ratio estimates have different standard deviations, and the simple mean can be misleading. The correlation coefficients are preferable.

Poisson regression of the number of mine victims

As mentioned, logistic regression loses a part of the information contained in the number of recent victims. In order to use this information, a number of Poisson regression models were calculated. The Poisson distribution is a distribution of rare events; the number of mine victims in a given community and year is considered a rare-event variable. In one of the models, the dependent variable was the number of recent victims per community. In another, the number was divided by the population of the community. Zero-inflation models (on whether the community had any recent victims or not) were also run, but the inflation was not significant. These models were estimated using the statistical software STATA.

Table 38 places the results of two ordinary Poisson regressions side-by-side; it is sorted by the absolute value of z, the standardized coefficient, in the community-based model. The population in the right-hand model is not used as an explanatory variable, but only as the rate denominator. The rate is formed using the absolute population size, not its logarithm.

It is obvious that, statistically, the population-based model is an improvement over the community-based one. However, the sudden high significance of the institutional modernization factor is an artifact. Institutional complexity is strongly correlated with population size; by eliminating population, this factor takes over its significance.

TABLE 38

REGRESSION RESULTS ON COMMUNITY AND RISK FACTORS

Number of recent victims

Variable	Community-based model			Population-based model		
	Coef.	z	P>z (95%)	Coef.	z	P>z (95%)
Access to some water blocked	0.85	4.467	0.000	0.87	4.573	0.000
Total estimated mined area surface (log 10)	0.35	4.261	0.000	0.26	3.274	0.001
Technical modernization	-0.41	-4.156	0.000	-0.71	-7.690	0.000
Current Population (log 10)	0.71	3.855	0.000	–	–	–
Distance to nearest other town with recent victims (log 10)	-0.49	-3.213	0.001	-0.54	-3.283	0.001
Distance to nearest mined area (log 10)	-0.24	-1.35	0.177	-0.37	-1.990	0.047
Years since mines were planted last	-0.01	-0.49	0.624	0.00	0.239	0.811
Institutional modernization	-0.01	-0.063	0.949	-0.45	-4.860	0.000
Constant	-14.55	-0.695	0.487	-3.35	-0.165	0.869
Exposure for rate	Const = 1			Population		
Goodness of fit						
chi-2	607.7			676.0		
Prob > chi2	0.206			0.004		
Pseudo R2	0.112			0.173		
Log likelihood	-398.2			-432.3		

Discussion of the regression results

There are significant differences, but also strong commonalities, in the answers that the models suggest to the two questions:

- What are the characteristics of affected communities that had some recent mine accent vs. those without accidents?
- What distinguishes communities with 0, 1, 2, etc., recent victims?

These are easier to comprehend by looking at Table 39. It compares the significance levels for the various factors and models. Again, the reader is reminded that a factor's influence is estimated to be stronger the smaller this number is. The cells with levels smaller than 10 percent are highlighted.

TABLE 39

SIGNIFICANCE LEVELS OBSERVED FOR MINE ACCIDENT CONTRIBUTORS

Variable	Logistic	Poisson-community	Poisson-population
Distance to nearest town with recent victims (log 10)	0.002	0.001	0.001
Technical modernization	0.006	0.000	0.000
Access to some water blocked	0.034	0.000	0.000
Years since mines were planted last	0.074	0.624	0.811
Total estimated mined area surface (log 10)	0.081	0.000	0.001
Current Population (log 10)	0.151	0.000	n/a
Institutional modernization	0.615	0.949	0.000
Distance to nearest mined area (log 10)	[.787]*	0.177	0.047

Note: The figure marked by [ ]* was calculated in a different model.

The models all concur to underline the importance of the distance to the nearest town with some recent victims, of the technical modernization factor, and of water blockages. The Poisson regressions considerably augment the emphasis on the water factor.

Major differences are found in the importance of the time that has lapsed since the last conflict. It appears that adaptation time does matter in determining whether a community still has any accidents at all or not. But for those that do, the historic era in which the mines and UXO were planted does not seem to be relevant any more.

In the Poisson models, the importance of the mined area surface and of the population size is increased. In the population-based model, the distance to the nearest mined area from the center of the community assumes considerable significance.

As already mentioned, the sudden significance of institutional modernization in the community-based Poisson model is artificial.

While additional analyses may modify this picture, mine action researchers may deduct a probable conjecture from the model differences found. As often with social phenomena, the acquisition of a trait and the further elaboration of that trait, once it is acquired, may be determined by different sets of factors, or by similar factor combinations but with different strength for the participating factors. This is likely the case also of the forces that operate on the mine accident hazard in Yemen.

Practical implications are discussed in the main body of the report.

Explanation on Scoring, Weighting, and Classifying Communities

THE MINE IMPACT SCORE

Scoring and classifying mine-affected communities according to the severity of impacts is a central element of the Landmine Impact Survey. While the score's basic function—to permit a priority ordering of communities—is easy to understand, its technicalities may defy quick comprehension.

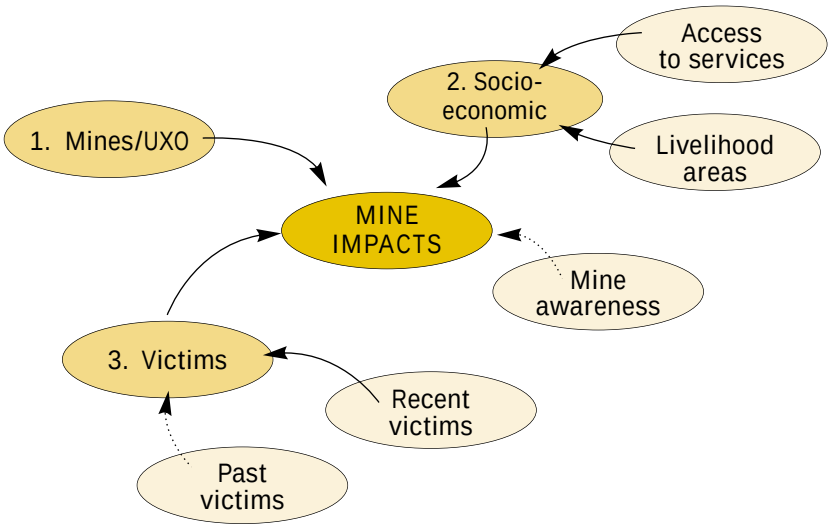
The mine impact score is a property of the community, not of any or all of the mined areas in or around the community, nor of the victims that have come to harm there. The score is indifferent to the number and size of the mined areas; it responds to three aspects of the local mine problem, listed below and reflected in Figure 14:

- Class of munitions
- The types of livelihood and institutional areas to which mines are blocking access
- The number of recent victims

Technically, the score is a linear combination of two munitions 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 one and zero, 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, within the guidelines that the Survey Working Group and the Survey Action Center have set in the interest of international consistency. The weights will be explained further on the following pages.

FIGURE 14

INFLUENCE DIAGRAM FOR THE MINE IMPACT CONCEPT USED IN THE LANDMINE IMPACT SURVEY



ELEMENTS OF THE SCORING MECHANISM

Four elements underlie the scores and classification: (1) the selection of variables (the indicators), (2) metrics (the way values are determined for the indicators and are passed to the scoring scheme), (3) weights (the relative influence given to the indicators), and (4) category bounds (the limits of numerical ranges of the scores corresponding to the categories).

Variables

The following are considered in the scoring:

- The presence of mines
- The presence of unexploded ordnance
- Access to crop land
- Access to community's pasture
- Access to water points
- Access to noncultivated area
- Access to housing area
- Roads that are blocked
- Access to other infrastructure
- Mine victims in the last 24 months

Within crop land, pasture, water and roads, distinctions are made. Irrigated land is distinguished from rain-fed land. Fixed pasture is distinguished from migratory pasture, mostly used by nomads. Drinking water is distinguished from water used for other purposes. Roads that lead to some administrative centers are distinguished from purely local roads and trails.

Each of those subcategories contribute to the score if access to some element of it is found blocked, except the local roads and trails, which do not count in the scoring.

With these distinctions, 15 different variables enter the scoring. They will be listed in the "weights" section. Other variables are not admitted in the database-driven scoring although users and researchers are encouraged to suggest additions and modifications for future revisions of the scoring mechanism by the Survey Working Group.

The score is indifferent to the population or territory of the community and considers neither the number of distinct mined areas nor their surface or proximity to the center of the community.

Metrics

The scoring follows a weak metric approach. The indicators only say whether a certain type of livelihood or institutional area is blocked by landmines. They do not say how much of it is blocked or how valuable the blocked area is. In other words, the existence of a problem is the criterion, not a threshold measured by size, value, population directly affected, or number of alternatives. Similarly, in the type-of-munitions area of the scoring, the scoring looks only at the presence of generic landmines and of UXO, not at numbers laid, sub-type, age, or origin. The weak metric was chosen for a number of consensus, validity and reliability reasons.

The victim part of the score has a stronger metric. The number of recent victims is a count variable. Although information is collected on the number of victims of less recent date, it does not affect the score. However, each recent victim contributes to the score. A victim who had a mine accident within the last 24 months prior to the survey date is considered a recent victim.

Weights

Once the presence of a certain blockage or munition type has been assessed over all the distinct mined areas in a community, the community-level indicator value is passed to the scoring mechanism. As an example, if a community has three mined areas and two of them are blocking access to two distinct pieces of irrigated crop land, only the value: "In this community, some irrigated land is blocked" = TRUE" is passed to the algorithm.

These values—expressed as 1 (TRUE) or 0 (FALSE)—are then multiplied with weights. The exception is the recent victims, for which not a binary, but the full count is passed and multiplied with its weight.

The weights used in the computation of the impact scores in Yemen are shown in Table 40.

TABLE 40

WEIGHTS USED IN COMPUTATION OF IMPACT SCORES

Variable	Weight
There were mines	2
There was unexploded ordnance	1
Access to some irrigated crop land was blocked	2
Access to some rain-fed crop land was blocked	1
Access to some fixed pasture was blocked	1
Access to some migratory pasture was blocked	1
Access to some drinking water points was blocked	1
Access to some water points for other uses was blocked	1
Access to some noncultivated area was blocked	1
Access to some housing area was blocked	1
Some roads to administrative centers were blocked	1
Access to some other infrastructure was blocked	0
Mine victims in the last 24 months	2

Country surveys can vary the weights for institutional and resource area blockages. The permissible variations have certain limits. The technicalities as described in the weights budget segment that follows. Different community classification outcomes in response to a hypothetical different weight set are also reported in this segment.

Category bounds

The survey works with four impact categories: "no known mine problem," "low impact," "medium impact," "high impact."

The category bounds are set as follows:

- No known mine problem: Score = 0
- Low impact: Score between one and five
- Medium impact: Score between six and 10
- High impact: Score 11 and above.

THE "WEIGHTS BUDGET"

The weights used in this survey were pre-set by the Survey Action Center, as authorized by the Survey Working Group. It is anticipated that the National Demining Commission will review them and will want to explore different weighting scenarios.

The review will respond to the need to let countries express the virulence of certain landmine impacts while keeping to a comparable framework for survey reports. This can be done by varying weights for the institutional and resource area indicators. In order to safeguard against grade inflation, and also to keep the relative influence of the socio-economic, munitions, and victim components in proportion, the weight settings have to respect certain limits, notably a "weights budget" that must not be exceeded.

Country surveys can set weights for the following indicators:

- Access to some irrigated crop land was blocked.
- Access to some rain-fed crop land was blocked.
- Access to some fixed pasture was blocked.
- Access to some migratory pasture was blocked.

- Access to some drinking water points was blocked.
- Access to some water points for other uses was blocked.
- Access to some noncultivated area was blocked.

- Access to some housing area was blocked.
- Some roads were blocked.
- Access to some other infrastructure was blocked,

The weights are also subject to the following rules:

1. Weights are one of the following integers: 0, 1, 2 or 3.
2. The sum of these weights equals 10.
3. The weight for access to migratory pasture is zero unless pastures essentially used by nomadic communities pose a mine problem.

It is permissible to set a weight to zero for an indicator for which there are occurrences in some affected communities.

SENSITIVITY OF THE COMMUNITY CLASSIFICATION TO WEIGHT CHANGES

As a practical experiment relevant to the Yemeni situation, the change in the number of communities classified as "high impact" is followed in response to selective weight changes. These concern indicators that have to do with water:

- Access to drinking water
- Access to water for other uses
- Access to irrigated crop land

The changes were made in the weights of water-related indicators because of the established association of these kinds of blockages with higher accident risk. Table 41 shows how the weights have been successively increased, to the permissible maximum of three. The weights budget was maintained, and therefore the weights of other indicators had to be decreased.

In the lower portion of the table, the consequences for the community classification are contrasted to the weight changes.

When all weights for all the water-related indicators are set to their highest, the number of high-impact communities doubles to 28. This amount is still small in comparison to the total 592 affected communities. In other words, the classification as high-impact communities is sensitive to the redistribution of emphases within the weight set for institutional and resource area blockages, but the overall distribution over the three impact categories is robust.

TABLE 41

COMMUNITY CLASSIFICATION, IN RESPONSE TO SELECTIVE WEIGHT CHANGES

Indicators, weights, outcomes

Scenario	A	B	C	D	E	F
Access to some irrigated crop land was blocked	2	2	2	2	2	3
Access to some rain-fed crop land was blocked	1	1	1	1	1	0
Access to some fixed pasture was blocked	1	1	1	1	1	1
Access to some migratory pasture was blocked	1	1	1	1	0	0
Access to some drinking water points was blocked	1	2	3	3	3	3
Access to some water points for other uses was blocked	1	1	1	2	3	3
Access to some noncultivated area was blocked	1	1	1	0	0	0
Access to some housing area was blocked	1	1	0	0	0	0
Some roads were blocked	1	0	0	0	0	0
Access to some other infrastructure was blocked	0	0	0	0	0	0
TOTAL WEIGHT BUDGET USED	**10**	**10**	**10**	**10**	**10**	**10**
Community classification						
High impact	14	18	20	23	28	28
Medium impact	84	88	85	80	78	73
Low impact	494	486	487	489	486	491

Survey Team Leader Report

SUMMARY

This report, based on the experiences of the Mine Clearance Planning Agency (MCPA) Landmine Impact Survey implementation team in Yemen, is focused on key operational and managerial issues, a number of important lessons learned and recommendations for parties that may be involved in the National Demining Committee (NDC) of Yemen and in other country surveys. Being the first ever Landmine Impact Survey to be executed to the Survey Working Group international standards and scrutiny, the Yemen survey has been a learning experience for all those involved in the implementation of the project directly or indirectly. It is interesting to know that the lessons learned and the documentation developed during execution of the Yemen survey have already proven to be valuable guidelines for other country surveys.

The Yemen survey was completed within the stipulated time-line and budget with all the quality requirements and standards complied with. The main factors, in our opinion, contributing to the successful implementation and completion of this project were the personal commitment and devotion of the local and international staff involved in the implementation of the project, tremendous support from the government of Yemen and associated in-country stakeholders, and the team work of the implementing organizations.

We learned that effective coordination of the project activities within the implementing organizations and with other stakeholders is a key element in the successful completion of the project. We also found that close supervision of the field operations is a main factor in the collection of quality and reliable data. It is a point of attention to note that the project was completed without any human or material losses.

The underestimation of the time for administrative set up, challenges in the translation of the survey questionnaire into Arabic, revision of the equipment list, replacement of the coding sheets and underestimating the training requirements, both in terms of time and money, were some of the key lessons learned. While the project did not face any problems in the selection, recruitment and training of the field staff, it needed longer time to recruit and train appropriate administration and logistics support staff.

The project enjoyed a professional relationship with the United Nations quality assurance monitor (QAM). Being the first project of its kind, the full-time presence of the QAM was beneficial to the project. However, full-time employment of the QAM has to be reviewed, based on the nature and requirements of future impact surveys.

The existence of an already established and functional mine action program, the completion of the U.N.-certified Landmine Impact Survey, and a comprehensive national mine action work plan will place the government of Yemen in a

strong position to seek the support and cooperation of the international community for its mine action operations. Using the survey findings will give the government, mine action authorities and other aid and development agencies an easy mechanism to set national mine action priorities. In addition, the lessons learned will also help other country surveys to manage most of the challenges faced by the Yemen survey.

In this document, I will organize my findings into two major categories, "observations" and "recommendations." The "observations" will summarize key activities and events, which took place during different portions of the survey. The "recommendations" section will contain areas that have been identified for improvement in future surveys as well as actions, which may be undertaken in Yemen now that the survey is complete.

Availing this opportunity, I would like to extend, on behalf of MCPA and SAC, my sincere appreciations to all those who have assisted the project directly or indirectly. I would like to particularly thank H.E. Dr. Mutaher Abdullah Al-Saidi, Minister of State for Cabinet Affairs and Chairman NDC; Mr. Philip Lewis, U.N. CTA/Programme Manager for Mine Action; Col. Qassim Abdul Salam Al-Shaibani, Director NTEU; Col. Mansoor Mohammad Al-Izzi, Executive Officer NDC; Ms. Rashida Al-Hamdani, member and rapporteur NDC, Mr. Justin Brady, U.N. quality assurance monitor and Officials at the United States Humanitarian Demining Programme for their valuable support and all the national and international project staff for their dedication and hard work resulting in the successful completion of the project.

OBSERVATIONS

Administration and logistics

ADMINISTRATIVE SET-UP

The amount of time, energy and effort required to address basic administrative and logistical matters in the initial establishment phase was underestimated. Resolving the support requirements for the survey, from housing to bank accounts and importation of goods, consumed a huge amount of staff resources. Therefore, more time should be allowed for this activity. A dedicated and qualified full-time administrative/logistics officer should be included in the project staff right from the beginning of the project.

PERSONNEL

International: There were four full-time and one part-time international staff members involved in the implementation of the project. The international staff included a full-time survey team leader, two area supervisors, an information management officer, and a part-time administrative/logistics officer. The administrative/logistics officer was deployed for two months at the beginning and two months at the end of the project. All the staff enjoyed excellent skills in relevant

areas of work. There were no problems in the deployment and withdrawal of the international staff. Availability of a full-time administrative/logistics staff would have spared more time of the other staff for operational issues.

National: All the positions of the project were advertised in the local newspapers. A large number of CVs were received for all the positions, particularly the field positions. Candidates for the field position included independent individuals, persons introduced by the Ministry of Education, Ministry of Local Administration, National Technical Executive Unit and NGOs. CVs of the candidates were reviewed and short-listed regionally. Candidates for the field positions were interviewed and selected at regional level based on their education, work experience, ability in English, personality and appearance, familiarity with their own governorates, and ability to frequently travel and stay overnight in the field.

The project did not face any major problems in recruitment and selection of suitable candidates for the positions of field supervisors and enumerators. However, the project could not obtain enough candidates with the required English-language skills for the positions of field editors for the training course of field supervisors/editors. In order to meet the shortfall of qualified field editors, eight English-speaking candidates were enrolled in the enumerators' training course that took place shortly after the training for the initial batch of field supervisors and editors. After completion of the enumerator's training course, the candidates went through an intensive field-editing course to be trained as field editors. The recruitment and training of qualified administrative and logistics support staff took the project twice the time originally expected. Therefore, most of the administrative and logistics issues had to be dealt with by the expatriate staff, which kept them under extra work pressure.

EQUIPMENT

Computer Equipment: The computer equipment including four laptop computers, seven desktop computers and two inkjet printers provided to the project were found short of meeting the overall project requirement. Therefore, additional computer equipment including a plotter and three laser jet printers were procured. Occasional additional requirements for computers were met from the local market. Some of the computer software including IDRISI, GIS Data Automation Kit and Digitizing Tables provided to the project were found to be in excess of the immediate needs of the project.

Digital Cameras and GPS Units: Like the computer equipment, the original allotment of three digital cameras and 12 GPS units were found to be short of meeting the project's requirements. Therefore, an additional 25 digital cameras and 16 GPS units were procured and provided to the project.

Vehicles: The project was provided nine Toyota Hilux pickups. However, the pickups were not found to be very practical for field operations in Yemen. This is because a majority of the mine-affected governorates required two or more survey teams. A pickup could not accommodate more than four persons while two survey teams had a total of six to seven persons including one supervisor, one editor, four enu-

merators and sometimes a local guide. This was particularly difficult when there were women in the survey teams. Therefore, a number of these pickups were used for office purposes or deployed to governorates where only one team was required. In order to meet the overall operational requirements of the project, an average of 12 rented vehicles were kept throughout field operations. The rented vehicles generally performed well, and the services rendered were satisfactory.

Customs Clearance Of Equipment: Customs clearance of project equipment could be time consuming. The Yemen survey did not face any major problems in the customs clearance of computer equipment and the related software. However, despite the cooperation of the concerned government authorities, the clearance of handheld radios, GPS units and vehicles took about twice as much time as expected.

Keeping in view the amount of project time and resources required for the customs clearance of project equipment, local procurement of office equipment such as computers, printers, plotters and digital cameras could be much quicker and more convenient. In addition, because of the short nature of the project, local procurement of secondhand vehicles or renting them from the local market could be considered a convenient and practical alternative in some countries.

COMMUNICATIONS

Communication between field personnel and project offices is an essential element in conducting successful field operations. Yemen is a functional country in terms of communication facilities. Telephone, fax and Internet facilities are available all over the country even in very remote and small towns. Therefore, communication between survey teams and the MCPA offices was very good. Survey teams remained in regular contact by telephone and fax with their respective offices providing information on their progress, asking for any advice or clarification.

FIELD ACCOMMODATION AND FOOD

A number of survey teams working in densely populated governorates such as Sana'a, Aden and Lahij were able to return home by the end of the working day as the maximum travel time was not more than two hours to the districts they worked in. However, the teams working in other governorates such as Ibb, Al-Baida, and Taiz where communities are located far away from each other had to stay overnight in the field. Hotels were not available in most of the district headquarters where the teams worked. Therefore, a number of the teams stayed with their friends or were offered accommodation by the community elders and leaders. Others had to rent quarters in district centers and stay there for their work period. Most of the teams availed the services of small restaurants for food at district centers or were sometimes invited in by the communities. This did not have any negative traditional or cultural implications in Yemen.

Survey teams working in scarcely populated governorates such as Hadramout, Al-Mahra, Shabwah and Sa'ada had difficulties in finding proper food and accommodation. Sometimes, the survey teams had to stay in the countryside

in somewhat uncomfortable living conditions or had to travel back to a place where they could find reasonable food and accommodation. However, it is worth mentioning that no community was abandoned due to unfavorable living conditions.

SECURITY

Generally, Yemen is a peaceful and safe country. There is no war, civil unrest or any major tribal conflicts. Therefore, no major security problems were experienced during project implementation. All the survey teams were able to work in the districts planned for field operations without any problems. And while some local incidents may have caused teams to temporarily change their plans, no community was left unsurveyed due to security reasons. In addition, the expatriate staff of MCPA did not experience any security problems during their field missions and could travel freely, even to very remote areas. However, travel for the U.N. QAM was restricted to a number of governorates by the U.N. security system.

Coordination

WITHIN MCPA YEMEN

MCPA Yemen operated through its head office in Sana'a (Northern Region) and two regional offices, one each in Aden (Southern Region) and Mokalla (Eastern Region).

The country was divided into three survey regions depending on the location of the MCPA offices and concentration of mine-affected communities. The field module of IMSMA database allowed data entry only in one location. Therefore, all the data personnel and data entry facilities were located in Sana'a, and all the data entry was done in Sana'a. A proper reporting and communication system was in place to make sure on-time dispatch of the completed questionnaires and their subsequent entry in the database. A survey-tracking management system was developed to make sure that every completed questionnaire along with all its attachments reached the data section in Sana'a. This coordination system was found to be effective and practical.

GOVERNMENT AUTHORITIES AND OTHER STAKEHOLDERS

Establishing sound working relationships with local authorities, at all levels of government, as well as with important mine action and development NGOs, is critical to the success of the survey. Explaining the survey, its roles and purposes may take a great deal of time and discussion, but it is time well spent. This activity is essential in order to prevent development of any false expectations and to ensure full understanding of what the survey achievements will be. The Yemen project was well coordinated at national and international level. UNOPS, UNMAS and SAC took care of the international coordination while MCPA and the U.N. QAM were responsible for the in-country coordination of the project activities.

As a result of the good coordination of the project activities, tremendous support was received from the concerned government authorities, United Nations Mine Action Program, the United States Humanitarian Demining Program, and

National Technical Executive Unit. For instance, the NTEU provided free space and facilities for all the trainings of field staff and provided 14 GPS units to the project on loan until the project GPS units were ready for use. The Ministry of Public Administration organized the initial phase of the expert opinion collection on potentially mine-affected communities and collected reports on 400 communities in nine governorates. Various other ministries and a number of NGOs also provided experienced people to work for the survey as field staff.

UNITED NATIONS QUALITY ASSURANCE MONITOR

The United Nations Mine Action Service certification guidelines were used as the principle document for the quality assurance purposes. A special form was developed and used for quality assurance by the U.N. QAM and other project staff. The QAM was able to visit 18 communities in 10 governorates, while staying well informed of all activities through daily interaction with the MCPA management team. The core processes of the survey and the collected data were found to be according to the survey standards. Timely, corrective action was taken as required. The QAM produced monthly quality assurance reports, which were shared with MCPA staff in advance of international distribution, and opportunities were provided for discussion on all key issues. Overall, the relationship between the MCPA team and the U.N. QAM is to be rated as very positive, professional and productive.

Being the first survey of its kind, the full-time assignment and co-location of the QAM was beneficial to the project in Yemen in terms of making quick and timely decisions on various time-line revisions, protocols and other operational procedures. However, the full-time assignment of the QAM has to be reviewed keeping in mind the workload, cost involved, utility, country of survey and the background of the management staff of the project.

REPORTING

A sound and practical reporting system was in place providing on time progress of the project to all implementing organizations and in-country stakeholders and the government authorities. In addition to the regular monthly progress reports, specials reports were prepared on all important events of the project including pretests, pilot test, mid-cycle review and other important events. Necessary decisions were made based on the results of important events over the span of the project.

LOCAL CAPACITY BUILDING

Although the Landmine Impact Survey is not technically a “capacity development” project, a survey will not be successful without adequate staff training and the creation of a body that can use survey products. This should be acknowledged and specific steps incorporated into survey planning and execution to ensure that adequate capacity does exist to support and use the survey’s products.

The Yemen survey assisted in several ways in the local capacity building. Training and employment of national staff in various positions such as field supervision, field data editing, survey and data entry/processing left a pool of knowledge, which could be used within the mine action program and by other organiza-

tions. More important, to enable the sustained use of the survey data by the concerned national mine action authorities, the National Technical Executive Unit (NTEU), the mine action-implementing establishment in Yemen, had assigned one full-time data processor to the project to work in the data section. In addition, 14 more qualified persons from the NTEU worked with the project as supervisors, editors and enumerators. It is hoped that the concerned staff at the NTEU will be able to use their abilities in the future mine action activities.

To ensure sustained utilization of the survey data, a separate follow-on project will be implemented in Yemen. Findings of this follow-on project should be recorded carefully and lessons learned shared with future impact surveys. The aim should be that activities of this project be incorporated as built-in functions of the future impact surveys, eliminating the need for such follow-on projects.

Operations

TRAINING OF FIELD STAFF

Proper training of local field staff is perhaps one of the most critical activities of the survey. At a minimum, this training will take four weeks and should include numerous practical exercises, role-plays and practice surveys. Careful screening of candidates for positions must take place as a high drop-out rate can be expected.

All the training courses for the field staff of the Yemen survey were conducted in the National Demining Training Center. Based on the results of the initial training course and first pretest, a retraining course was conducted for supervisors and editors. The retraining mainly included the points from the field supervision of the first pretest, revised questionnaire/coding sheets, community and village mapping, gazetteer, GPS/Radio and basic skills of supervision. The project was well prepared for the enumerators' training course by translating all the basic training materials into Arabic. The trained local supervisor provided assistance during the training of the enumerators.

The training plans developed by MCPA for field supervisors and editors were found to be practical and covering all the requirements for the successful implementation of the project. However, a standard training plan needs to be developed for the use of future country surveys.

SURVEY DOCUMENTS

Survey Questionnaire: The survey questionnaire is a well structured document that worked in the Yemeni society. The logical sequence of the questions and flow of the interview made it easier to elicit information from the community in a comfortable and social environment. In order to make the questionnaire country-specific, a number of questions were changed or reworded in various parts of the survey questionnaire based on the results of the survey pretests and feedback from the field supervisors/editors. However, translation of the questionnaire and other relevant survey documentation into usable Arabic language was challenging. This eventually required the translated questionnaire to be revised by the MCPA Data Manager, the local translators and a group of English-speaking field supervisors

and editors. Keeping in view the problems experienced during the translation of the questionnaire from English into Arabic, the re-translation was not attempted due to nonavailability of the required translation resources and the question of its utility.

Scoring Sheet: The scoring sheet was found to be practical having no major problems. However, space for names and signatures of enumerators and supervisors was added for recordkeeping purposes. It is worth mentioning that some of the survey teams overapplied the percentage of increase or decrease on the scoring sheet in the beginning of the field operations. This percentage is meant to compensate when the questionnaire does not give an accurate picture of the level of impact in a village. It is assumed that such discrepancies are caused by unusual circumstances or one-time events and not inherent deficiencies in the questionnaire, which should be fairly accurate in gauging impact. For instance, in one governorate the percentage of six out of nine scoring sheets was increased. It was, therefore, stressed during the subsequent debriefing sessions of the field staff that the percentage change should be employed very rarely and in very special cases and not for simple reasons. This overusage seems to be a case of members of the team unfamiliar with the impact of mines and UXO that made them react in a subjective manner. However, the usage of the percentage adjustment score almost disappeared in the following months of field operations as the field staff realized that the change of the percentage adjustment, in most cases, did not change the impact category of a community.

Coding Sheets: The original coding sheets were longer than the survey questionnaire, by about 33 pages. It took 3-4 hours of a field editor's time to transfer data from the questionnaire to the coding sheets for one community, and then the same amount of time was required to enter the data into IMSMA. Therefore, new coding sheets were developed reducing the number of pages to only seven. The new coding sheets exactly mirrored the IMSMA data-entry screens. All the field editing and data entry staff expressed their satisfaction over the layout and practicality of the new coding sheets. The new coding sheets doubled the work output of the field editors and data entry personnel.

Protocols: SAC provided three main protocols to MCPA for use of the project staff in the field to ensure a better understanding of the survey procedures and assist in effective field operations. These protocols include "Protocol for Enumerators," "Protocol for Supervisors," and "Protocol for the Control of False Negatives." All these protocols were translated into Arabic and used during training and in the field by field staff. The feedback on the protocols from the field staff is very positive.

EXPERT OPINION COLLECTION

The collection of expert opinion on the location of possibly mine-affected communities was an ongoing process from the beginning of the project until just before the data collection was completed. Information on the location of possibly affected communities was elicited through several means, including government

sources, NGOs, TV and radio public awareness campaign, and the district-level visits of the trained MCPA field staff. While the information from the Ministry of Local Administration took more time than expected, the district-level visit of the MCPA staff proved to be the quickest and best method. The accuracy of the expert opinion was about 46 percent—out of the 1,294 reported communities, only 592 confirmed to be mine-affected.

COMMUNITY MAP DRAWING

Three ways of community mapping were tested during Pretests 1 and 2: by community interview participants alone, by enumerators alone, and by enumerators with inputs from community interview participants. The later method, maps drawn by the enumerators with inputs from the interview participants, proved to be a good participatory tool and produced the best quality maps.

PREARRANGEMENT OF COMMUNITY MEETINGS

Community meetings were arranged in advance in most of the governorates. However, this was not practical in some governorates due to the great travel distances between communities. Communities in some governorates such as Hadramout, Shabwah, Al-Jawf and Al-Mahra are located so far from each other that a round-trip to a community took 6-7 hours on average. On the other hand, in a number of governorates such as Dhamar, Ibb, Taiz and Hajja the roads were so difficult that a 4x4 vehicle could not move more than 10km/h. Therefore, in these governorates, the supervisor and survey team usually had to travel together, arrange the community meeting, complete the survey and then move on to another community.

KEY INFORMANTS

Because of the social and cultural practices in Yemen, most of the key informants consisted of males. However, survey teams with female members were able to obtain inputs from women in the community by holding a separate meeting with women by the female member of the team. The backgrounds of the key informants mainly depended on the type of community. In rural areas, government personnel, community elders, and farmers were mainly the key informants. In suburban areas the key informants mainly included government personnel, community elders, and schoolteachers.

PROXIMITY VERIFICATION

Verification of mined areas through the application of the "proximity verification" protocol was aimed at reconfirming the information provided by the community interviews. All mined areas were verified from safe points, considering all the safety measures. The distance of verification depended on the location of mined areas. Mined areas located in flat land were possible to be verified from a distance 50-100 meters. However, mined areas located in hillsides and mountains were verified from a distance of 500-1,500 meters. The visual verification helped in the confirmation of the information provided by the community interview in regards to size, vegetation and surface of mined areas.

SIZE ESTIMATION OF MINED AREAS

The evaluation of the pretest revealed the enumerators overestimated the size of the mined areas. However, this issue was addressed during Pretest 2 and retraining of supervisors and editors and the training of enumerators. During the pilot test and the subsequent data collection, enumerators were able to make more reliable estimates of the mined areas by asking various questions from the participants during the community interview who were attempting to exclude known safe areas from the estimates. Nonetheless, it is still felt that the estimated surface areas are too large.

REGROUPING SMALL COMMUNITIES OR SPLITTING LARGE COMMUNITIES

During the survey pretests we learned that regrouping small communities was not a good exercise, particularly in areas where the tribal system is stronger and when the mined areas are at a distance from each other. The supervisor had arranged for one community meeting by regrouping 3-4 small communities in at least two locations. However, when it came time to determine which mined area affected which community, the community members could not agree with each other, and strong disputes arose. Therefore, regrouping of small communities for interviews was avoided in the subsequent surveys. As far as splitting large communities is concerned, the survey teams did not conduct this activity during the interviews. The survey teams did not experience any problems in splitting large mined areas located at various sides of the mined areas.

WEEKLY COORDINATION MEETINGS

Regular weekly meetings between enumerators and supervisors took place in the field. During the weekly meetings, field staff scored and prioritized communities. In addition, they prepared and coordinated their work plans for the following week. The weekly meetings were found to be a good coordination and planning tool.

CONTROL OF FALSE NEGATIVES

The control of false negatives was found a time consuming task. In addition, it took a lot of effort to clarify the intent and extent of the sampling between MCPA and SAC and then get across the idea to the field staff. In addition, there was no time specifically budgeted for the control for false negatives in the project timeline. However, when the intent and extent of the sampling was clarified, the project was able to implement the false negative sampling in 100 districts out of the reportedly 119 districts, sampling and visiting more than 1,807 communities. Among the communities sampled and visited, only 15 communities were missed during the survey, which is an indicator of a high and reliable level of coverage.

DISTRICT MAPPING

Using different symbols for all communities surveyed, false positives, false negatives, etc., maps were prepared for all affected districts. The draft of the district maps was prepared in the field and was refined after the return of the survey teams to their respective regional offices. The district maps provided an overall picture of the mine contamination in a district.

TIME AND LOCATION FOR COMMUNITY INTERVIEWS

The impressions gained from Pretest 1 indicated that community interviews would be held mainly during Qat-chewing sessions in the afternoons. (Qat is a leafy plant, which acts as a stimulant when chewed. Yemenis regularly meet in a social or even business setting and chew Qat while holding discussions.)

However, Pretest 2 revealed that in some areas interviews were also possible in the morning. During Pretest 2, a number of interviews were held in the morning. The morning interviews were held mainly in the rural areas, while this was very limited in the suburban areas as most of the people are busy in the morning. The morning interviews were arranged in various places including schools, mosques, and houses of local sheikhs, etc.

It was found that the morning interviews are more convenient for the survey teams as they could do the visual verification on the same day. However, this depends on the judgment of the field supervisors and availability of the key informants in the community.

FIELD STAFFING AND SUPERVISION

The field staffing and supervision chain (team leader → area supervisors → field supervisor/editor → enumerators) exercised by MCPA in Yemen was found to be properly supporting the overall field staffing and supervision mechanism. The team leader and area supervisors were able to track their survey teams in most of the governorates on a daily basis, where communication facilities were available. However, in governorates where communication facilities were very limited, the teams contacted their relevant offices on a weekly basis, and any other time they were required to do so.

The field supervisors were able to track their teams on a daily basis. The supervisors who were in-charge for one team were able to attend most of the community interviews. However, supervisors with two or three teams could attend only a few of the community interviews, as they were mainly busy in the coordination of community interviews.

ROLE/WORKING MECHANISM FOR WOMEN

There were a total of 12 women among the 81 field staff. The survey teams with male and female members could work in most of the mine-affected areas. Generally, female enumerators could sit in on the all male meetings without any problems. An exception occurred in just two meetings, which could not be attended by one of the female enumerators in Al-Dhale' governorate due to a local situation. However, having mixed meetings of women and men were not possible in general. Only in Mareb and Hadramout governorates, a total of two mixed meetings of women and men took place. In these cases the whole community was from one tribe and related to each other.

In order to have inputs to survey results from women in the community, the male and female members of the survey team conducted the all-male group interview together. At the end of the meeting, the survey team split. The male member of the team conducted visual verification while the female member held a brief

meeting with women in the community to focus on the socio-economic impact questions. The team discussed their findings at the end of the day and prepared one completed questionnaire for the community incorporating information from both meetings.

Information Management System for Mine Action (IMSMA)

MCPA Yemen found the overall approach to populating the IMSMA database to be fundamentally sound and practical. Version 1.2 of the IMSMA had addressed most the shortfalls experienced by MCPA Yemen in version 1. However, there are a number of other points to be addressed in future versions. These points mainly include introduction of a built-in control mechanism for the control of logical and human errors, avoiding double entry of the same data in several fields, permission of data entry and uploading in multiple locations and introduction of more user-defined reports.

RECOMMENDATIONS

In the execution of impact survey

1. Consideration must be given to the local culture and security situation in the deployment of the international staff. It is recommended that the international staff of the project have familiarity with the religious, cultural and security situation of the country.
2. The country survey should allow enough time for administrative setup and should have as part of the team an experienced and qualified administrative/logistics officer.
3. The expatriate project staff should effectively coordinate the project activities with all concerned players in the country to ensure successful implementation of the project.
4. Administrative and logistical issues may take considerable time of the expatriate project staff. Therefore, the team must be supported by qualified administrative and finance staff to minimize diversion of the team's attention from the main management and operational issues.
5. The implementing organization must ensure early acquisition of shape files, gazetteer and census information as they will be required during training and then in pretest or pilot test and data collection.
6. Consideration should be given to the recruitment of field staff from the areas where they are expected to work. This type of arrangement proved to be very helpful in the effective coordinationof project activities and ensures support from the local people in the conduct of the survey in the respective areas.
7. The implementing organizations need to ensure timely procurement and provision of the project equipment as this will significantly influence the conduct of the field and office activities.

8. All project offices should be properly equipped with necessary office equipment. This might include good-quality computers, heavy-duty laser jet printers, and a heavy-duty photocopier machine. The project main office also has to be provided a good-quality plotter for plotting big size maps, charts and graphs. SAC has already updated the equipment list and specifications based on what was learned in Yemen. In turn, SAC has provided this list to Chad and Thailand.

9. Customs clearance might be time consuming and resource taking. Therefore, local procurement of all available equipment has to be given serious consideration.

10. Proper translation of the survey questionnaire and other documents could be challenging. Great care has to be taken in the translation of the mine action terminology from English into local languages.

11. The project expatriate staff should give proper and close supervision of field operations and ensure timely corrective actions in terms of survey methodology and data collection.

12. The field staff must always adhere to the highest safety standards, following the "proximity verification" protocols and an assessment of the local conditions. Survey staff set an example for local inhabitants, and any unsafe actions can give a false impression regarding the true hazards of a mined area.

13. The deployment and utility of a full-time versus part-time quality assurance monitor should be reviewed and considered as a requirement for each country survey.

National Demining Committee and/or Mine Action Program

There are a number of strengths and challenges that the mine action program in Yemen will need to address. The main strengths include a functional Mine Action Programme, U.N.-certified Landmine Impact Survey, possession of IMSMA, existence of strong local support to mine action activities, and availability of basic facilities in most of the affected communities. The major challenges are location, securing sufficient funding for programs, and expansion of mine action operations in the priority mine-affected communities. Building on the existing strengths, with personal commitment, proper planning and coordination, the challenges can be overcome with relative ease. Below are a number of specific recommendations explained very briefly:

1. *Development of Comprehensive National Mine Action Work Plans:* Using the survey findings and results, the NDC should now develop a comprehensive national mine action work plan, which sets priority targets for the next 25 years. The proposed follow-on survey utilization project by SAC, MCPA and Cranfield University will play a vital role in this effort, but it is not a substitute for a national commitment to planning.

2. *Broadening the Donor Base and Expansion of the Mine Action Activities:* The current mine action resources, about 200 deminers, at the disposal of the Mine Action Programme in Yemen are far from meeting the mine action requirements. Therefore, the NDC will need to broaden the base of support and funding level provided by the mine action donors. Survey data, besides being used to prepare a clear national works plan, will provide a baseline upon which performance can be measured and continued support ensured.

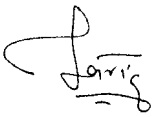
3. *Involving International Mine Action Organizations:* Currently, mine action is being executed through about 300 military personnel, 200 already trained and 100 still under training, detached from the Yemen Army by decree. In addition, there is only one channel of funding which is through the United Nations. However, there seems to be enough interest from other international Non-governmental Organizations (NGOs) active in the field of humanitarian mine action to work in Yemen. Such organizations bring tremendous skills and experience and often assist in generating funding support. Therefore, it is recommended that the NDC consider involving other mine action NGOs under a proper coordination mechanism.

4. *Introduction of Explosive-Detecting Dogs to Mine Action:* A considerable portion of the claimed contaminated land seems to contain very few explosive devices. The areas were abandoned because of odd accidents and incomplete understanding of the threat. Checking and clearance of these suspected mined areas using only manual detection will consume large amounts of mine clearance resources with only limited results. In other countries with similar terrain and climate as Yemen, explosive-detecting dogs have been demonstrated as a proven and cost-effective technique for rapidly clearing large amounts of land.

5. *Proper Composition of Survey/Clearance Teams:* Out of the total affected area of 923 million square meters, about 259 million square meters consist of gullies, hillside or ridge and are located in generally mountainous terrain. Access to affected communities located in this type of terrain could be very difficult. In addition, the availability of basic facilities such as water, food and accommodation is also very limited in these communities. Therefore, deployment of large demining teams will not be practical to these communities. Instead, small survey and clearance teams, perhaps supported by explosive-detecting dogs, will be more practical and cost-effective. This will also be convenient in terms of logistical support to these teams. Larger demining teams *will*, however, be practical and effective in the 534 million square meters of flat land in the affected area. Therefore, proper structure and composition of teams will significantly influence the effectiveness of the mine operations.

CONCLUSION

The successful execution of the impact survey in Yemen was made possible through the generous contributions and involvement of a broad network of individuals and organizations. Enough thanks cannot be given to all those who provided assistance. A great deal was learned during the course of the work in Yemen, not just about the mine situation in that country but about the survey process in general. It is hoped that what has been learned can now be put to good use in Yemen and in other mine-affected countries.



QADEEM KHAN TARIQ
MCPA, Team Leader
Yemen Impact Survey

Al-Heswa Community

INTRODUCTION

Al-Heswa is one of the mine-impacted communities in Al-Boriqa district of Aden governorate. It is located 26 kilometers north of Aden city. The Landmine Impact Survey in Al-Heswa community was carried out on 8 November 1999. The survey reports indicate that there are two mined areas in this community blocking access to some agriculture and pastureland and fishing with an estimated surface land of 160,000 square meters. According to the survey impact scoring mechanism, the community is considered highly impacted.

This case study was prepared by Mr. Salal Hussain, Architectural Engineer and Ms. Amat Rahim, Bachelor of Science from 1–5 July 2000. Mr. Salal and Ms. Amat worked as a field supervisor and an enumerator for the Landmine Impact Survey. They surveyed several UXO- and mine-affected communities to collect UXO and mine affect-related information.[8]

Aim

After the data collection of the Landmine Impact Survey was completed in June 2000, a number of community case studies of the affected communities were undertaken. The objectives of these case studies are to

- Balance the statistical nature of the survey with more personalized testimony from members of affected communities,
- Re-verify some of the key information that the enumerator teams had collected, and
- Visualize the situation of those communities in terms of the contamination history and subsequent initiatives by community members and authorities to improve it.

COMMUNITY PROFILE

Al-Heswa community is a coastal community situated on the coast of the Free Zone Area and on the main road that links Al-Mansoora and Al-Buraiqa districts. The vicinity of the community is flat land. It has a coastal, hot climate. The Arabian Sea in the south, Jawalah village in the north, Abo-Harbah village in the east and Al-Shaab city in the west surround this community.

It is a compact village with a population of about 4,000. The number of females is estimated to be five percent higher than males. Children make up one quarter of the total population. Basic features of civilization can be seen in the village including a commercial market that extends from the center of the village along the main road.

[8] In order to convey the sense of the original material, the English translations have been only minimally edited.

A view of Al-Heswa village

This community is distinct from other communities because of its composition of fishermen and farmers. The fishermen are separated from the farmers by the main road in the center of the village. The fishermen are living to the south near the seacoast while the farmers are living in the north and are mainly involved in farming and husbandry.

It is worth mentioning that the fishermen "Al-Sa'yadeen Hafah" were the first who lived and established this village. The farmers "Al-Mozar'een Hafah" came from different areas. The majority of them had come from Abyan governorate and settled there. In addition to fishing and farming, which are considered the main economic activities, the locals are engaged in basic trading and the extraction of vinegar from trees called "Al-Adwash."

Facilities

In terms of facilities, Al-Heswa has all the important and necessary facilities because of its location close to Aden city. Main facilities include 24-hour electricity supply, piped water, and telephone. Al-Heswa has only one primary school where 960 children, boys and girls, are learning. It does not have a secondary school. However, students go to Al-Shaab School that is in Al-Shaab town, two kilometers west of the village. There is no medical center in this community; however, they do have access to a free medical center in Al-Shaab town.

HISTORY OF LANDMINE CONTAMINATION

A view of the mined areas in Al-Heswa community

Due to the disagreements on a number of issues related to reunification in 1994, the security situation deteriorated between South and North. The borders were closed eventually and a separate government was announced in the South. This resulted in a war between South and North, which lasted for 70 days. Al-Heswa was among several communities affected by the war.

The entire community left their houses and moved to safe areas such as the town of Aden and Shikh Othman. During this time, landmines were used in a vast area from Jawalah in the north to the seacoast in the south. All this area is called Bir Fathal. The area is mainly contaminated with anti-tank and anti-personnel mines, as the land is flat and easy for military personnel and vehicles.

Landmine impact

The community is suffering many social and economical problems due to the presence of landmines and UXO on their lands. The following paragraphs describe the problems faced by this community.

ECONOMICAL PROBLEMS:

- Agriculture: Landmine contamination in the farmland in the north of this village has caused the production of crops to cease and water wells to become dry. In an interview with a group of farmers, Mohammed Abdulla Amer, a farmer, said that the first mine was exploded under a tractor in the agricultural land. The tractor was destroyed completely. He said that they informed the army and later deminers from the army came and removed some of mines from this land using a tractor. Mohammed said that they do not use this area, as they suspected that there were more mines.
- Animal Husbandry: Landmine contamination affected animal husbandry in this community. As many as nine camels, five cows and nearly 60 goats were killed by landmines from 1994 to the present. In an interview with a group of shepherds, Rashid Awadh Tamba, the owner of animals, said that he had lost six camels and three cows because of mines. Rashid said that the animals were let free during the war and we could not come close to them because of the landmines. He said that he had gotten used to this situation and that he was not afraid of landmines anymore. Rashid said that he found many mines, and he had handed them over to the Army. He further explained that the shepherds knew how to deal with mines. He said that once they encountered a mine, they mark it for the safety of other shepherds and travelers. Meanwhile, they inform the military staff about it.
- Fishing: The presence of a large number of UXO on the coast and in seawater indicates the impact on the fishermen in this community. In a group interview with some fishermen, Ali Fadhle, a fisherman, said that the presence of UXO and its fragments in the sea have caused a lot of financial and human problems to them. Ali said that a big size fragment and the wreckage of two planes were still left in the sea. This endangers their lives and degrades their earnings. He further said that three fishermen were injured when they were tampering with UXO in late 1994. He said that this was the first accident, and it was a warning and a great lesson for all of them to stay away from these items. Since then, no fisherman comes to harm as they do not go into the mine- and UXO-contaminated areas.

HUMAN LOSSES

Landmines have killed four and injured seven persons in Al-Heswa community. The study team approached the families of the mine victims in order to see how landmines affected them and their families. Following are stories of some of the mine victims or their families visited during the case study.

The Recent Incident: On 17 May 1999, four young men, Hassan Ahmed Salem, 26; Mohammed Saeed Mohammed, 21; Mohammed Ahmed Salem, 15; and Issa Ahmed Salem, 13, went to the farms as usual. They were cutting corn at the farms and carrying the corn by camel cart to the market. On this day, there were some other carts in a line heading toward the farms. When passing by a road in the agricultural land situated between Bir Fadhle and Bir Ahmed, Essa left the cart, trying to hunt a bird with his bow. The cart went off the road. After a few steps the cart ran over an anti-tank mine. A big explosion took place. Hassan, Mohammed and Mohammed Ahmed were killed at the spot. They were shattered into pieces beyond recognition. Essa survived the incident, as he was not on the cart. He received injuries on his left leg. During the visit, the case study team met the family members of these victims and they explained.

Mohammed, 21, killed in a mine incident on 17 May 1999

Hassan Ahmed Salem: He was 26 years old and had completed sixth elementary grade. He was the main supporter of the family after the death of his father. His family is considered the poorest in this community.

Mohammed Saeed Mohammed: He was 21 years old. He finished his first year in high school. His papers were sent to the technical institute (Al-Mansoora). He was supporting the family of three boys and three women and his aunt. His death affected his father's health. His mother has never passed by the road where her son was killed.

Mohammed Ahmed Salem: Mohammed, 15 years old, finished fifth grade. His father said, "he was my right hand."

Essa Ahmed Salem: The only survivor of the incident, Essa is 14 now. He is studying in the fourth grade. He has been stressed since the incident and has developed psychological problems.

Nabil Kakoo Awadh: He was 14, living with his divorced mother, four brothers and four sisters in one house. After the war was over in 1994, they returned to their home. On their second day of their return, Nabil without informing his mother left the house with two friends to collect shells and sell them in the Al-Annad area. Soon after, an explosion was heard and Nabil was taken to Al-Jumohriyah Hospital. He died two hours later while his friends survived, who received minor injuries.

Fathi Saleh Saad: Fathi Saled Saad was a young fisherman, 23 years of age. He was living with his divorced mother three sisters and four brothers. One day in late 1994, he went with his friends Yasser Ali and Badr Hassan to walk along the coast. They found a shell. Yasser took it but Fathi shouted at him not to touch such things, as they are very dangerous. Then Yasser threw it

back, thinking it would land on the sand, but unfortunately it hit a rock. It exploded and seriously injured the three of them. They survived the incident.

MINE ACTION ASSISTANCE

The study team met demining teams that were camped south east of Al-Heswa community. They were trained personnel of NTEU equipped with metal detectors, vehicles and necessary mine clearance equipment. The second in command of the team explained that they were preparing to demine or clear Al-Heswa as fast as possible. He said that they came here two days ahead of the case study team visit and that they were waiting for their own level two survey result. He further said that demining Al-Heswa would take a long time because a huge area is contaminated. "We will clear this land according to the international standards," he said. When asked about difficulties, he replied with a smile, that there are no major difficulties except the hot climate, diseases and mosquito bites. He said that they can handle mines easily but not mosquitoes. They had difficulties clearing the destroyed areas. Moving sand made their work very difficult and dangerous. During the visit it was noticed that mine awareness had been provided to the community through a variety of means such as lectures in the classes, meetings, distribution of leaflets and brochures. The mined areas were marked and surrounded with barbed wire by the army in 1997.

CONCLUSION

Al-Heswa community suffers in a higher degree because a huge number of the population is exposed to the danger of landmines. As mentioned earlier, the main economy sources such as agriculture, husbandry and fishing are severely affected by landmines and UXO. Landmines block an estimated 60,000 square meters of productive agricultural land and an estimated 100,000 square meters of pasture-land. In addition, nine camels, five cows and 60 sheep and goats have been killed. This has all resulted in a great loss to the economy in the community. On the human side, mines killed nine and injured two persons. Three young men were killed, and one injured just last year. This and many other incidents in this village have caused the entire population to live under continuous stress and psychological problems because of the presence of landmines.

Al-Qroodh Community

INTRODUCTION

Al-Qroodh is one of the mine-impacted communities in Al-Dhale' district of Dhale' governorate. It is located 52 kilometers north west of Al-Dhale' city. The Landmine Impact Survey in Al-Qroodh community was carried out on 23 January 2000. The survey recorded three mined areas with a surface land of 637,000 square meters blocking access to some irrigation and drinking water, agricultural and pasture land and roads to other villages in this community. According to the survey impact scoring mechanism, the community is medium impacted.

This case study is prepared by Dr. Mohammed Al-Amari, Educational Researcher and Abdullah Al-Marzoqi, Agricultural Extensionist from 17–21 June 2000. Mr. Al-Amari and Mr. Al-Marzoqi worked as an enumerator and a field supervisor for the landmines impact survey in various governorates. They surveyed several mine- and UXO-affected communities in the republic of Yemen to collect mine and UXO impact information.[9]

Aim

After the data collection of the Landmine Impact Survey was completed in June 2000, a number of community case studies of the affected communities were undertaken. The objectives of these case studies are to

- Balance the statistical nature of the survey with more personalized testimony from members of affected communities,
- Re-verify some of the key information that the enumerator teams had collected, and
- Visualize the situation of those communities in terms of the contamination history and subsequent initiatives by community members and authorities to improve it.

COMMUNITY PROFILE

Al-Qroodh is a compact community with a population of about 350. Almost 55 percent of the total population is children under 14 years old. Of the total population, 95 percent are aged between 15 to 55 with 60 percent females. Al-Qroodh borders with Al-Mashaweer community in the north, Jebel Yehiya community in the east, Bathar community in the south and De Najar in the west.

The Al-Qroodh valley, which lies at the bottom of the village to the western and southern side, reflects beautiful scenery. The Qat (a plant that the Yemenis chew) trees mainly cover this valley. The main economy of this community like many other communities in Yemen is agricultural and animal husbandry products.

[9] In order to convey the sense of the original material, the English translations have been only minimally edited.

A view of Al-Qroodh community

Qat and other crops such as grains, ghoreb and shamiah are mainly planted on the farms. The first thing that could be noticed in the early morning was the active atmosphere among the villagers. Males, females, and children were seen on the farms. Some children were seen with cattle heading towards the pastures. It made it difficult to talk or speak with the people unless one waited until noon time when everybody returned home for lunch, followed by a Qat session.

To reach this village, you have to take the Aden-Sana'a main road until you approach Sanah market located in the middle between Al-Dhalea' and Qataba towns. From there, the road to the west called Qataba will lead to Al-Qroodh village.

Facilities

It is very disappointing when the majority of the population in the community is children, but they don't have any school. Those who want to study have to walk eight kilometers to Al-Mashoreah where a school of three classrooms is available. For an elementary stage, he/she has to walk for 10-15 kilometers to Batag village. The worst is that a child who wants to continue preparatory study must ride 50 kilometers daily to Dhale' or Qataba towns.

A Yemeni child bringing water on her donkey in Al-Qroodh community

Girls are deprived of schooling because of the location of the schools and being involved in housework and grazing animals. Most of the boys do not finish their primary study. Only two in the village were found who had finished their high school. One of them was killed in the conflict in 1982, and the other is still alive, working as a farmer.

There is no electricity supply in this community. The inhabitants use traditional lamps for lighting houses. The villagers are hopeless of having electricity in the near future because they consider themselves as the "forgotten people," as expressed by one of their elders.

Water is brought from the wells or the valley normally by women in special containers carried on their heads or on donkeys.

Telecommunications is not considered an important issue in this village because they lack many other important facilities. Lack of a health facility and physician in this community have led to the spread of illnesses such as malaria and typhoid. The majority suffer seriously from lack of hygienic food and vitamins. They depend on traditional meals such as grains, porridge, gharib, bread cooked in the houses, and tea. Only a few could have meat, fish, vegetables and fruits with their meals. Firewood is used for cooking.

HISTORY OF LANDMINE CONTAMINATION

Al-Qroodh community is situated on the former border between South and North Yemen. Landmines were used by both sides to protect the borders in 1980.

A view of a mined area in Al-Qroodh village

Since then, landmines have been taking the lives of the innocent people and the animals in this community. As stated by the villagers, the first mine exploded on the farm of Al-Haj Ali Ahmed Al-Suraimi in 1980, killing Saeed Al-Suraimi, who was working on this farm. The villagers used a bull in the area to make sure if the area was clear, but the bull never returned alive. The army engineers were informed, and they took out 12 anti-personnel mines from the area, but the farm was never productive again. The area is not viewed as cleared from mines.

LANDMINE IMPACT

Landmine contamination surrounds Al-Qroodh community from all sides. It blocks irrigated agricultural land, roads to other villages, drinking water and irrigation water, and pasture land in this community. This has created many economical, social and human problems for this community. As one of the villagers said, the landmines besieged them. The landmine problems are explained in the following paragraphs.

Economical problems

About 350 live stock including camels, cows and goats have been killed in this community. Landmines have restricted recreation activities for the villagers. The three mined areas Shaab Al-Dahool, Adaen Saad and Shaab Al-Dhabrah block an estimated 637,000 square meters of agricultural and pasturelands. The entire community is living under continuous stress. The presence of landmines on roads connecting this village to neighboring villages creates a great deal of trouble. People have, therefore, used other remote and longer ways inconvenient to them. Many villagers have left the community for economical and safety reasons and gone to other villages. This has in turn decreased the skills and the importance of the village both economically and socially.

The family of Ahmed Mohammed Al-Higri is considered the most affected family in this community. Because their farmland is situated at Shaab Al-Sanbrah, a mined area, it has been left uncultivated to the present.

HUMAN LOSSES

In addition to the many economic problems, landmines were responsible for killing two and injuring two other persons. One was killed just a year ago. Following are stories of some of the mine victims.

- Haja Mariam Muthna lost her left leg and left hand in a landmine explosion in 1994. She was met by the researcher at her house. About her involvement in a mine incident she said, "On the second day of the 1994 war, I woke up as usual and prepared the breakfast. My husband then left to work on the farm. I took my 40 goats and two cows for grazing at the other side of the valley with my son, Mohammed, 11 years old. The goats grazed, while I was watching them from one side and my son from the other side. I saw a donkey tied to a tree. I felt sorry for him and decided to let him free. After a few steps, I heard an explosion, and I was up in the air. I did not lose consciousness. I knew it was a mine because I had seen several other mine incidents in the village. Later, I was taken to a hospital in Aden." She continued, "One month after treatment, I returned without my left leg and half of my left arm. Landmines killed many of my goats and cows."

Haja Mariam Muthana, a landmine incident survivor

- Mariam Ali Saleh, another landmine incident survivor, lives in a small hut built of mud. She lost her leg in an explosion of a mine incident in 1984. She lives in a miserable condition with little support from other villagers.
- Abdo Ali Ahmed Al-Suraimi, a 15-year-old boy, is another innocent victim of a landmine. Abdo Ali died in a mine incident in 1988. His close friend Abdulla Mohammed Saleh, told us:

  "We were too close. We went to the same school, used to sleep sometimes in each other's house. One morning, he told me that he was going to replace one of his brothers in grazing animals. At nine o'clock, he was blown up by a mine and died."

  We met Abo Ali's father, and he said that in addition to his dear son, mines had taken the lives of his 25 goats, 30 camels and seven cows so far.

CONCLUSION

Al-Qroodh suffers vastly due to the landmine contamination. In fact, landmines surround the community. Facilities are blocked, and this has resulted in the deteri-

oration of the village economy. They have suffered significant resource loss due to the landmine contamination. As noted from the case study, the community is severely affected by mines. Landmines block 637,000 square meters of productive irrigated agricultural land, fixed pastureland, water that is used for irrigation, roads and ways to other villages. However, in terms of mine action assistance, no or very little attention has been paid to this community so far. Perhaps the existence of so many mined areas in this district and the remote location of this community are among the reasons for the delay. The landmine issue is the priority issue in the community and authorities may take quick and effective action.

Sirfah Community

Editor's Note: The case of Sirfah demonstrates the strength of the case study method to both confirm the initial descriptions obtained during routine survey operations and as a method to detect the out of the ordinary. Sirfah, originally identified as a low-impact community during the survey experienced a mine accident just days after the enumerator team departed the Governorate. This accident drives home the perennial character of the landmine infestation, which has plagued this community since the 1960s.

INTRODUCTION

Sirfah is one of the mine-impacted communities in Bani Study district, Sana'a governorate. It is located 30 kilometers west of the city of Sana'a. The Landmine Impact Survey in Sirfah community was carried out on 2 December 1999. The survey recorded one mined road with a surface of 600 square meters. According to the survey impact scoring mechanism, the community is low impacted.

This case study was prepared by Mr. Salal Hussain, Architectural Engineer, and Ms. Amat Rahim, Bachelor of Science, from 17–25 June 2000. Mr. Salal and Ms. Amat worked as a field supervisor and an enumerator for the Landmine Impact Survey. They surveyed several mine- and UXO-affected communities in the republic of Yemen to collect mine and UXO impact data.[10]

Aim

After the data collection of the Landmine Impact Survey was completed in June 2000, a number of community case studies of the affected communities were undertaken. The objectives of these case studies are to

- Balance the statistical nature of the survey with more personalized testimony from members of affected communities;
- Re-verify some of the key information that the enumerator teams had collected, and
- Visualize the situation of those communities in terms of the contamination history and subsequent initiatives by community members and authorities to improve it.

COMMUNITY PROFILE

Khadrah was the name of Sirfah village until 70 years ago. The name of the community was changed from Khadrah to Sirfah by Turk forces when they failed to take it over. Sirfah is a dispersed community, and it is divided into several sub-

[10] In order to convey the sense of the original material, the English translations have been only minimally edited.

A view of Sirfah village

communities. Sirfah proper is located in the center, Al-Sirm to the southwest, Al-Aridhah and Najd al-Ma'een to the south. For more details, please refer to the attached map. All these communities are located at Al-Qa'a valley surrounded by a series of mountains including Al-Rayman, Ghosh Al-Ghorab, Sarateh, Lakmat Huras and Al-Nawash. Al-Ga'a valley is famous for planting grapes and cereal products, such as corn, popcorn, wheat, and barley.

The population is estimated at 1,200-1,300 people. About 75 percent of the total population is under 40 years of age. The number of females is estimated five percent higher than males in this community.

Economically, this community depends on agricultural products and animal husbandry. A small group of residents is dealing and selling village products in outside markets. Most of the agricultural land is rain-fed. They have turned it into Qat (a stimulant plant that the Yemenis chew) planting land in the recent years, which gives them a very high and fast return. The women are playing the main role in the economy of this community because they are working on the farms and looking after animals.

Facilities

Sirfah does not have medical facilities, a piped water supply or telephone facilities. Electricity has been supplied recently, after the Landmine Impact Survey was carried out in December 1999. The provision of electricity brought a great change in the level of awareness in the society due to the introduction of television. There is one school in this community for the primary and intermediate levels, which runs in two shifts morning and afternoon. This society is in desperate need for a school to accommodate the increasing number of students. There is also a need for a secondary school, as students are obliged to walk for long distances to reach the educational centers. There is no school for the females. However, the villagers are allowing their girls to study with the male children until the fourth class. Only a few would allow their daughters to reach the sixth level.

The roads are of a great concern. The government intends to pave the main road, "Najd Al-Salaf," which is near the old, mined road. According to the villagers, this road will be paved in the coming months. If this is done, it will bring about a great change in the life of this society. Grapes as well as other crops will easily get to market.

HISTORY OF LANDMINE CONTAMINATION

The Bani Study tribe is considered a part of the famous Khawlan tribe. It is one of the largest Yemeni tribes supported by the Monarchs. As one of the poets of Sirfah village, sheik Naji Al-Ghader, said in one of his poems:

The Al-Tiyal Mountain announced and tells all Yemeni Mountains,
We shall never be republicans even if we pass away from life.
Even if today returns to yesterday or the sun rises from Aden
Or the land burns, or the clouds rain bullets.

Since the Republicans' struggle started on 26 September 1963, the Khawlan tribe announced their loyalty to Imam who was leader of the Royalists. The conflict resulted in the intervention of the Egyptian army in support of the Republicans and their entrance to Khawlan and to Bani Study areas. The Republicans made Dijjah, which is located two kilometers west of Sirfah village, the center from which they attacked neighboring tribes including Sirfah.

Najd Al-Salaf mined road in Sirfah village

After a long guerilla war against the Egyptians, the tribes were able to drive the Egyptians out from their area. The Egyptians camped at the Ghosh al-Gorab mountain. The Royalists were at the Nawash and Sarateh mountains. The headquarters of the Royalists was at Al-Nagee'ain valley inside a cave. The conflict lasted for about two years. The strongholds of the Royalists and Al-Sirfah village was bombarded at least 400 times by the Republican air force, which led to the destruction of 12-17 houses in the village.

The use of landmines in the area commenced when the Egyptian army was forced to re-camp at the top of the mountains in 1963. They used anti-personnel landmines around their positions to protect them from the sneaking of the tribesmen at night. At the same time, anti-tank mines were used by the Royalists at the Najd al-Silf road to prevent the Republicans entering Al-Sirfah and to protect their positions at Al-Nagaeeailn.

The conflict ended in 1967 with the withdrawal of the Republican forces after they had received huge losses due to guerrilla war by the tribes of this area. All those mined areas, which were laid by the Egyptian army, were either cleared or exploded by people or by animals. Only one mined road with a surface land of 600 square meters remained uncleared. This road blocks access of the Sirfah village to the outlying villages and towns.

From the very beginning of landmine contamination, the community had been educated about the hazards of the Royalists landmines. They were well aware of the mine problem in their village. However, the first anti-tank mine was exploded by a camel led by Ahmed Hamadi Al-Shaikh from Dagah village in early 1964. He was using this road with no knowledge of mine contamination. As a result, the camel died on the spot, and Ahmed Hamadi Al-Shaikh survived the incident with no injury. This road was never used again after this incident.

LANDMINE IMPACT

The use of landmines in Sirfah caused a lot of economic problems. When the conflict ended, Sirfah was in need of reconstruction as about 25 percent of the houses were destroyed by air bombardment. Since the main road to the village was mined, it delayed the reconstruction process of the village. As many as 200 livestock were killed by mines in the old military position on the top of the hills. All those areas, other than the road, were cleared by the villagers using their animals to run over minefields. This unsafe practice caused the degrading of animal husbandry in this community. The presence of landmines and UXO left behind six injuries and two deaths. Most of the victims were children.

"The establishment of a new road, parallel to the mined road, by the government in 1980 solved the transportation problems in our community," said one of the community drivers, Ali Hussin Saleh Al-Faqeed. "However, before the establishment of this road, we had a lot of problems. For instance, he said that, the construction of the school and extension of the electricity to Sirfah was delayed." He further mentioned how the patients and pregnant women died before reaching a medical center because of the lack of a road. He stated how negatively this affected the village products such as crops and especially grapes. The poor condition of the road, the high transportation cost, and lower return for crops sold have contributed to the poverty of the community. He said the building materials and consumer goods brought from outside the village cost more. Mr. Ali Hussin said this has caused poverty among farmers and damaged considerably the economy in the community.

Human Losses

As mentioned earlier, landmines and UXO injured six and killed three persons in this community. During the visit to Sirfah for the purpose of a community case study, the researchers also visited a recent mine victim who came to harm after the impact survey enumerator team's had completed their research.

Jameelah Mohammed Mosleh, who is only 12 years old, and her brother, Ali Mohammed Mosleh (age 28), were involved in this incident. Ali was cleaning a shelf of a cabinet near the window to get the electrical wire through. He was throwing items from the shelf to his sister who was receiving them downstairs. Among the items Ali threw was a mine which had been kept at their house for a long time, which he did not know. Upon hitting the ground, the mine exploded, and Jameelah received some injuries on her leg and one above her left eye. She

was treated in time, but there is still some shrapnel in her leg. Jameelah can not work due to the pains in her leg.

Saleh Ahmed Al-Qadhi was another victim who died three years after the incident. He was 12 years old when he was involved in a UXO incident in 1968. His mother said, "Saleh went to graze his goats, and while he was passing, he saw something strange on the road. He tried to destroy it, but smoke erupted from the strange item and caused blindness to him. Three years later while grazing animals he fell into water well and died." During the interview, it was noted that Saleh's mother's sight was affected from sorrow and much crying for her son.

TABLE 42

MINE/UXO VICTIMS IN SIRFAH VILLAGE

Victim name	Age	Accident date	Activity during accident	Killed/ injured	Present job
Saleh A. Al-Qadi	12	1968	Pasture	Dead	–
Rawiah Al-Faqeeh	40	1970	House work	Injured	House wife
Hussein A. Hameed	38	1973	Pasture	Injured	Private job
Mahdi Al-Qadi	40	1973	Pasture	Injured	Herder
Saleh M Addrsee	29	1980	Pasture	Injured	Farmer
Ahmed Al-Nousairi	30	1980	Pasture	Injured	Farmer
Ayshah Al-Nousairi	13	1980	Pasture	Dead	–
Mohd. Naji Saleh	8	1990	Tampering	Dead	–
Jamila M. Mousleh*	12	2000	House work	Injured	House wife

*The last mine accident took place after completion of the Landmine Impact Survey and is not reflected in initial community score.

Hussein Ahmed Mohammed Hamid, a 38-year-old man, is another victim. He was involved in an incident when he was 11 years old. He found a bullet and started to play with it. Suddenly, it went off, cutting one of his fingers. His sister told us that Hussein is working hard to support his family. He works as a laborer carrying cartons of grapes. Although he has very little income, he sometimes helps their parents too.

Rawiyah is a 40-year-old childless widow whose husband died seven years ago. She was involved in a UXO incident when she was 10 years old in 1970. She was tampering with a UXO in the yard of her house when it exploded. It caused a wound on her right hand. She is unable to work due to this wound. She refused to marry again because of the negative experience from her first marriage. She had married an older man who was not well. She was more of a nurse than a wife.

Aishah was a 13-year-old child killed in 1980. Other innocent victims who were injured in this community are Saleh, 29-years-old; Ahmed, 20-years-old; Mohammad, 65-years-old; and Mahdi, 40-years-old. Table 42 shows mine and UXO victims in Sirfah village.

CONCLUSION

With the establishment of a new road parallel to the mined road in 1980, most of the problems of this community have been solved. However, during the conflict and after the conflict was over in 1967, the community suffered a lot because of the presence of landmines and UXO. There were so many scattered mines on the top of the hills, which have either been exploded by animals or been cleared by the villagers. The only mined road, which is almost forgotten by the villagers nowadays, is a potential treat for this community. This has to be cleared as soon as possible.

Estimation of Prevalence of Mine-Affected Communities in Yemen

Lawrence H. Moulton | 2 July 2000

These numbers are based on the status report of 10 June 2000 by the survey team in the Republic of Yemen. In particular, the spreadsheet titled, "Status report as 10 June 2000-revised according to new census information," with survey results from 119 districts is used.

Of 1,294 communities suspected of being affected, 577 were found to be actually affected. A stratified sample (by district) of those communities not suspected was performed, in accordance with a predetermined lot quality assurance sampling (LQAS) rule. If any sampled community was found to be affected, neighboring communities were also investigated according to protocol. Of the 14,780 "not suspected" communities, 1,809 were sampled and investigated, of which 15 were found to be affected, the rest not affected.

ESTIMATION 1

This estimation procedure assumes that the strategy of going to neighboring communities is equivalent to the full procedure of investigating all communities in a district in which a sampled "not suspected" community was found to be affected. Alternatively stated, it is assumed that because of an expected strong spatial correlation, this procedure would have found virtually all affected communities because of the small chance of having isolated affected communities being randomly (or even haphazardly) distributed throughout a district.

The estimated proportion (prevalence) of affected communities among the 16,074 communities of interest is simply (577 + 15)/16,074 = 0.0368, or almost four percent. Under the above assumption and classical sampling theory, this estimate has zero variance associated with it, since each district in which there were zero affected communities found through the sampling has an unbiased estimate of "zero affected" and zero variance, and for those with nonzero affected communities in the sample, the assumption is that the search around those communities found all affected communities, and thus there is no variability.

ESTIMATION 2

This estimation is carried out under the much milder assumption that the sampled and investigated communities were representative of the nonsampled (and nonsuspected) communities in the given district. This results in a "worst-case" scenario, in which we apply the proportion of the sampled communities that are

affected to the number of nonsampled communities to estimate the total affected communities in a district.

Let $N = \sum N_h$ be the total number of nonsuspected communities from which the samples are drawn, with N_h the number of communites in the hth district. The proportion (p) of affected communities (a) in a sample of n_h in a district is given by: $p_h = a_h / n_h$, and the proportion of affected communities in all the districts, according to the classic formula for stratified sampling (Cochran, *Sampling Techniques*, 3rd ed., 1977; Wiley, New York; p.107) is:
$p_{st} = N^{-1} \sum_{h=1}^{119} N_h p_h$. Further, we estimate its variance by:
$\hat{V}(p_{st}) = N^{-2} \sum N^2_h (N_h - n_h) p_h (1 - p_h) / [(n_h - 1)]$.

Applying these formulas, we get $p_{st} = 0.001719$, which we apply to 16,074 – 1,294 = 14,780 to get 25.4 estimated affected communities among the "not suspected" group (of which 15, or 59 percent, have been identified). Taking the square root of the estimated variance and using 15 as the lower bound, a 95 percent confidence interval for the number of affected communities in the "not suspected" group is (15, 41.4).

The overall estimated prevalence of affected communities among the 16,074 is, therefore, (577 + 25.4)/16,074 = 0.0375, with a high-end estimate of (577 + 41.4)/16,074 = 0.0385, still less than four percent.

COMMENTS

The high degree of sensitivity of the designation of suspected areas resulted in finding very few false negative communities. This means we can be highly confident that almost all affected communities have been found. A somewhat conservative estimate is that only 10.4 affected communities (25.4 – 15) have not been identified as such, which means (577 + 15)/(577 + 25.4)¥100% = 98.3% of all affected communities have been identified.

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