Landmine Impact Survey

Republic of Mozambique

Certified by the United Nations Certification Committee

Implemented by the Canadian International Demining Corps
and Paul F. Wilkinson and Associates Inc.

September 2001

Republic of Mozambique

PROJECT ABSTRACT

The *Landmine Impact Survey Republic of Mozambique* summarizes the results of a nation-wide survey of the community-level impacts of landmines conducted in Mozambique between 1999 and 2001. This survey is one in a series of country-specific reports on the location of suspected mined areas and their socio-economic impacts on communities. Forming part of the Global Landmine Survey Initiative conceived in Ottawa in March 1998 by the participants at the Ottawa Workshop on Mine Action Co-ordination, the survey in Mozambique was executed to attain the standards for Landmine Impact Surveys set by the Survey Working Group while at the same time ensuring that the methodologies employed and the outputs took into consideration the special needs and circumstances of Mozambique. This report is therefore designed to be read in conjunction with the *Global Landmine Survey Initiative October 2000* published by the Survey Action Center of Washington, D.C., a copy of which is appended. This report is also structured in general conformity with the *Writer's Guide* issued by the Survey Action Center on 22 March 2001.

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Introduction

The Canadian International Demining Corps and Paul F. Wilkinson & Associates Inc. (collectively referred to as the "CIDC") executed the Mozambique Landmine Impact Survey ("MLIS"), on behalf of the mine-action authorities of the Government of Mozambique between January 1999 and August 2001. Funding totaling approximately U.S.$2.2 million was provided by the Canadian International Development Agency ("CIDA") as part of the Canadian Mine Action Program in Mozambique.

Forming part of the Global Survey Initiative, the MLIS is a tangible product of the *Ottawa Convention*. In the words of the Survey Working Group ("SWG"), Landmine Impact Surveys are intended to *…facilitate the prioritizing of human, material and financial resources supporting humanitarian mine action at the national, regional, and global level*. They permit national authorities to formulate plans that focus on the most heavily impacted regions and communities, they assist donors to apportion funds on the basis of human needs as measured by impacts on communities, and they provide implementing authorities with baseline data against which to measure the success of mine-action initiatives.

The MLIS was implemented in accordance with the guidelines promulgated by the SWG. Independent quality assurance was provided primarily through a Quality Assurance Monitor ("QAM") contracted initially by the Survey Action Center ("SAC) and later by the United Nations Mine Action Service ("UNMAS"), and secondarily by the National Demining Institute ("IND") and the CIDA.

Interim provincial reports were submitted to the IND and the CIDA between February and June 2001 for information purposes and in order to elicit comments to guide the preparation of this report.

The primary product of the MLIS is the populated Information Management System for Mine Action ("IMSMA") database developed by the Geneva International Centre for Humanitarian Demining on behalf of the UNMAS and the SAC. The IMSMA database, duly populated with the data collected during the MLIS, was formally handed over to the IND on 15 June 2001, together with 15 vehicles and computers and other equipment. This and other reports on the MLIS serve principally to explain how the data in the IMSMA database were collected, to summarize the principal findings, and to illustrate a few of the ways in which those data might be used.

Neither this report nor the data stored in the IMSMA database constitutes a national mine-action plan. They are, however, a prerequisite for preparing such a plan, in that they are nation-wide in

scope and focus, for the first time in Mozambique, on the community-level social and economic impacts of landmines and unexploded ordnance ("UXO"). The IND has declared its intention to use the data in the IMSMA database and other data to prepare a national plan and to mobilize funding for its execution. Indeed, the Government of Canada, through the United Nations Development Program ("UNDP"), has already provided funding for the former purpose.

The very nature of a LIS dictates that the data collected are primarily descriptive. They constitute the best and most comprehensive description possible of the social and economic impacts of landmines and UXO on the citizens of Mozambique at the time and in the circumstances of the MLIS. In some cases, they will permit the competent authorities to implement mine-action programs of various types, while in others they will serve as a basis for research to deepen understanding of certain facets of the landmine problem as described herein.

Executive Summary

OBJECTIVES

On behalf of the national mine-action authority in Mozambique, the purpose of the Mozambique Landmine Impact Survey ("MLIS") was to collect, record and analyze information on the location of known or suspected mined areas throughout the country, and to provide an overview of their social and economic impacts as perceived by the residents of landmine-affected communities.

DELIVERABLES

Primary deliverables comprised: a database of accumulated information, maps and sketches; hard copies of all the survey instruments and protocols; indices for ranking impacts; and a comprehensive national report including methodology, findings and analysis. Collectively, the foregoing provides, for the first time in Mozambique, an invaluable tool to guide future national mine-action that is responsive to socio-economic impacts. An important by-product of the MLIS was a national gazetteer in the form of a toponymy database.

TIMELINE

The MLIS was identified as a mine-action priority by Mozambican authorities and the Canadian International Development Agency ("CIDA") in November 1997, and was subsequently included as a major component of Canada's support for mine-action in Mozambique as documented in an inter-governmental agreement signed in August 1998. The Canadian International Demining Corps ("CIDC") was contracted to execute the MLIS in January 1999 and began a year of planning, recruitment, training and preparation in February 1999. Fieldwork began in March 2000, and the MLIS was completed in August 2001.

KEY PARTICIPANTS

The MLIS was executed by the CIDC in partnership with Paul F. Wilkinson & Associates Inc., and funding was provided by the CIDA. Important roles were also played by a wide range of organizations and individuals throughout Mozambique and internationally. Nationally, these included: the IND; the Instituto Nacional de Estatística; the HALO Trust; the Accelerated Demining Program; Norwegian People's Aid; Handicap International; the Polícia da República de Moçambique; Forças Armadas de Moçambique; the Ministério para Coordenação de Acção

ambiental; the Ministério da Agricultura e Pescas; the Ministério dos Recursos Minerais e Energia; the Ministério da Saúde; the Ministério do Plano e Finanças; the Ministério da Educação e Cultura; the Ministério de Indústria, Comércio e Turismo; the District Administrations in all 127 Districts visited; and several parastatal organizations and commercial demining companies. International participation included the United Nations Mine Action Service and the Survey Action Center.

SUMMARY OF METHODOLOGY

Execution of the MLIS was based on the methodology approved for LISs by the UNMAS. Its basic components were: (i) collection and analysis of expert opinion to identify communities that are likely to be affected by landmines or UXO; (ii) visits to each of the communities so identified to validate that information, and completion of group interviews in those that self-identified as landmine-affected; (iii) visits to a sample of the communities not identified by expert opinion as landmine-affected, and conducting group interviews in those found to be landmine-affected; (iv) entry of the data collected into a database; and (v) conduct of preliminary analysis thereof. As with other LISs, adaptations were required to address the unique conditions in Mozambique. Factors that had to be taken into consideration included: the size of the country and the condition of its transportation infrastructure; the widespread distribution of landmine-affected communities; the absence of a national gazetteer or equivalent; inadequate pre-existing mapping; and the relatively limited availability of expert opinion.

COST

The MLIS was funded by the CIDA. Aggregate costs were equivalent to approximately US$2.2 million, of which almost US$0.5 million was invested in vehicles and equipment that remain available for IND's ongoing mine-action programming.

SUMMARY OF RESULTS AND CONCLUSIONS

The MLIS provides previously-lacking information needed to devise and implement a mine-action work plan based on priorities derived in part from the consideration of landmine impacts. The results of the MLIS demonstrate that virtually every part of Mozambique continues to experience numerous negative social and economic consequences from landmine and UXO contamination. The data collected and stored in the IMSMA database, combined with relevant and reliable data from other sources, constitute a basis for Mozambican authorities to define priority targets for mine-action and to design and execute cost-effective measures to address the most serious consequences of the landmine problem. Targeted and effective mine-action is required to improve the circumstances of the 1.5 million or more persons affected by landmines

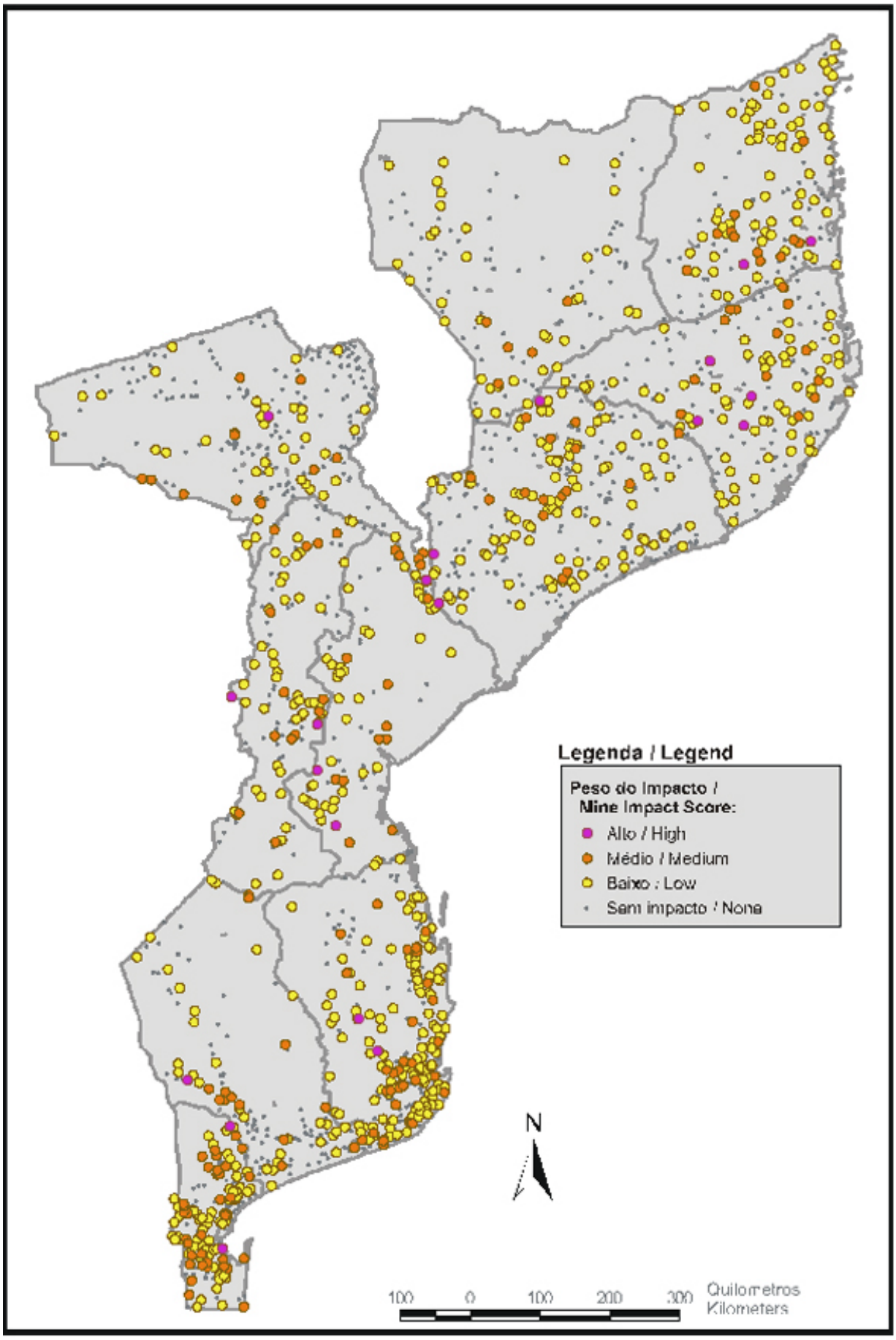
in Mozambique, and it is also a precondition for sustained national social and economic growth over the longer term.

Based on interviews with approximately 13,000 persons, the MLIS identified 791 landmine-affected communities, 938 communities that were not affected by landmines, and 1,374 Suspected Mined Areas ("SMA").

The data stored in the IMSMA database lend themselves to further analysis, but the following summarize the principal findings of the MLIS:

- Landmines affect all 10 Provinces of Mozambique and 123/128 Districts.
- At least 1.5 million persons, representing no less than nine per cent of the national population in 1997, are affected by landmines.
- 768 of the landmine-affected communities are classified as rural, but 23 urban communities, including three with populations greater than 30,000 persons, are also affected.
- A total of 1,374 SMAs was identified. They cover an estimated 562 square kilometers. Some 41 per cent are less than 1,000 square meters in area, and less than five per cent are larger than one square kilometer.
- Nine years after the end of hostilities, landmine accidents still occur: at least 172 of the total of 2,145 landmine victims recorded during the MLIS had come to harm during the two years preceding it.
- The most frequent blockage impacts of SMAs are on: agricultural land (464 communities, 950,000 persons, 369 square kilometers); roads (231 communities, 369,000 persons); and non-agricultural land used for hunting, gathering firewood, and other economic and cultural purposes (180 communities, 291,000 persons, 137 square kilometers). Blocked access to drinking water is less frequent (55 communities, 87,000 persons), but it is nonetheless a serious impact.
- On the basis of the Mine Impact Score ("MIS") approved by the SWG, 20 communities with 36,000 persons are high-impact, 164 communities with 393,000 persons are medium-impact, and 607 communities with 1.1 million persons are low-impact.

Map 2 DISTRIBUTION OF LANDMINE-AFFECTED COMMUNITIES



LIST OF ACRONYMS AND SYMBOLS

ADP	Accelerated Demining Program
AIDS	Acquired Immune Deficiency Syndrome
CD	Compact Disk
CHC	Canadian High Commission
CIDA	Canadian International Development Agency
CIDC	Canadian International Demining Corps (formerly Centre)
CND	National Demining Commission
DF	Definitely Landmine-Free
EOC	Expert Opinion Collection
GICHD	Geneva International Centre for Humanitarian Demining
GIS	Geographic Information System
GLS	Global Landmine Survey
GPS	Global Positioning System
Ha	Hectare
HF	High Frequency
HIV	Human Immunodeficiency Virus
HQ	Headquarters
IDRC	International Development Research Centre
IMSMA	Information Management System for Mine Action
IND	National Demining Institute
INE	Instituto Nacional de Estatística
km	Kilometer
LIS	Landmine Impact Survey, formerly Level One Impact Survey
MCPA	Mine Clearance Planning Agency
m	Meter
MIS	Mine Impact Score
MLIS	Mozambique Landmine Impact Survey
NGO	Non-governmental Organization
NPA	Norwegian People's Aid
PA	Probably Landmine-Affected
PEPAM	Programa para Prevenção a Acidentes contra Minas
PF	Probably Landmine-Free
PFWAI	Paul F. Wilkinson & Associates Inc.
PIP	Project Implementation Plan
PSU	Project Support Unit
QAM	Quality Assurance Monitor
SAC	Survey Action Center
SMA	Suspected Mined Area
SOP	Standard Operating Procedure
SWG	Survey Working Group
UN	United Nations
UNDP	United Nations Development Program
UNMAS	United Nations Mine Action Service
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
UXO	Unexploded Ordnance
VHF	Very High Frequency
VSQ	Village Survey Questionnaire

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Findings

Appendix I presents a District-by-District overview of the principal findings.

EXPERT OPINION COLLECTION

Expert opinion collection ("EOC") began at the National level. Between February and September 1999, interviews and data-collection meetings were held with 39 sources, and the DITERS database of the IND, the ADP's database, and Handicap International's Programa para Prevenção a Acidentes contra Minas ("PEPAM") database were searched. Much useful information was collected, but it became evident that a greater level of effort than had originally been anticipated would have to be devoted to collecting expert opinion at the Provincial and, especially, the District levels.

A further 202 interviews were therefore conducted at the Provincial and District levels between March 2000 and February 2001 (Table 1), and the databases of the HALO Trust and the NPA, among others, were searched.

The product of the EOC was the selection of 1,973 communities for visits by survey teams, and the acceptance of the following cities as not impacted by landmines, which does not, however, correspond to an assertion by the CIDC that they are Definitely Landmine-Free ("DF") in the sense employed by the SAC: Nampula, Inhambane, Chimoio, Lichinga, Quelimane, Inhassunge, Pemba, Beira, Tete, Xai-Xai, Maputo, and Matola cities. Two islands, Ilha de Moçambique (Nampula Province) and Ilha Ibo (Cabo Delgado Province), were also accepted as not impacted by landmines.

Table 1 OVERVIEW OF OFFICIAL INTERVIEWS AT THE PROVINCIAL LEVEL

Province	Interviewee Category					
	Governor	District Administration	NGO	Police	Other	Total
CABO DELGADO	1	8	3	7	-	**19**
GAZA	1	12	2	6	1	**22**
INHAMBANE	1	10	3	11	1	**26**
MANICA	1	2	3	2	-	**8**
MAPUTO	1	8	1	8	-	**18**
NAMPULA	1	3	4	5	-	**13**
NIASSA	2	9	7	1	3	**22**
SOFALA	1	10	2	11	1	**25**
TETE	1	9	5	8	3	**26**
ZAMBEZIA	1	9	7	3	3	**23**
TOTAL	**11**	**80**	**37**	**62**	**12**	**202**

GROUP INTERVIEWS

Table 2 presents an overview of the effort directed at group interviews: group interviews were conducted in all 791 communities that self-identified as landmine-affected; the 938 communities that self-identified as not being landmine-affected did not require group interviews; 208 communities were inaccessible, predominantly on account of flooding and damaged transportation infrastructure; and group interviews could not be conducted in four communities, principally because the *Regulo* was absent, while 32 others no longer existed or could not be found. Basic information about inaccessible villages, including the reason for their inaccessibility, was entered in the IMSMA database.

Table 2 OVERVIEW OF GROUP INTERVIEWS

Province	Group Interview Conducted	Group Interview Not Required	Community Inaccessible	Other[1]	Total
Cabo Delgado	84 (59.6%)	50 (35.5%)	7 (4.9%)	0	141
Gaza	46 (28.6%)	95 (59.0%)	20 (12.4%)	0	161
Inhambane	157 (50.5%)	125 (40.2%)	19 (6.1%)	10 (3.2%)	311
Manica	60 (42.2%)	58 (40.8%)	21 (14.8%)	3 (2.1%)	142
Maputo	100 (43.9%)	97 (42.5%)	25 (10.9%)	6 (2.6%)	228
Nampula	81 (48.9%)	72 (42.6%)	14 (8.3%)	2 (1.2%)	169
Niassa	40 (27.8%)	76 (52.8%)	25 (17.4%)	3 (2.1%)	144
Sofala	52 (40.9%)	32 (25.2%)	37 (29.1%)	6 (4.7%)	127
Tete	58 (24.1%)	161 (66.7%)	20 (8.3%)	2 (0.8%)	241
Zambézia	113 (36.6%)	172 (55.7%)	20 (6.4 %)	4 (1.3%)	309
TOTAL	**791 (40.1%)**	**938 (47.5%)**	**208 (10.5%)**	**36 (1.8%)**	**1973**

[1] Includes communities that declined to participate, could not be found, or had been abandoned.

The accessibility of communities was a significant problem in Sofala and Niassa provinces and relatively less so in Cabo Delgado, Inhambane, and Tete provinces. The figures on inaccessibility shown in Table 2 for Nampula and Zambézia provinces are understated, since parts of Lalaua District in the former and the whole of Chinde District in the latter were inaccessible, but the number of communities that would have been visited in each are not shown in Table 2. Comparative figures on accessibility are rare, but a recent re-survey of Zambézia Province by the HALO Trust reported that at least 7.3 % of communities/mined areas were permanently or seasonally inaccessible, slightly higher than the level encountered by the CIDC's survey teams (Table 2).

Table 3 NUMBER OF PARTICIPANTS IN GROUP INTERVIEWS

Province	under 5	5 - 8	9 - 12	13-15	16	Unspecified	Total
Niassa	1 (2.5%)	20 (50.0%)	11 (27.5%)	8 (20.0%)	-	-	40
Cabo Delgado	3 (3.6%)	11 (13.1%)	30 (35.7%)	40 (47.6%)	-	-	84
Nampula	3 (3.7%)	20 (24.7%)	29 (35.8%)	29 (35.8%)	-	-	81
Zambézia	6 (5.3%)	57 (50.4%)	33 (29.2%)	16 (14.2%)	-	1 (0.9%)	113
Tete	2 (3.4%)	36 (62.1%)	12 (20.7%)	7 (12.1%)	-	1 (1.7%)	58
Manica	2 (3.3%)	42 (70.0%)	13 (21.7%)	3 (5.0%)	-	-	60
Sofala	2 (3.8%)	35 (67.3%)	11 (21.2%)	4 (7.7%)	-	-	52
Inhambane	8 (5.1%)	104 (66.3%)	29 (18.5%)	14 (8.9%)	1 (0.6%)	1 (0.6%)	157
Gaza	1 (2.2%)	31 (67.4%)	12 (26.1%)	2 (4.3%)	-	-	46
Maputo	2 (2.0%)	63 (63.0%)	22 (22.0%)	13 (13.0%)	-	-	100
Total	**30 (3.8%)**	**419 (52.9%)**	**202 (25.5%)**	**136 (17.2%)**	**1 (0.1%)**	**3 (0.3%)**	**791**

The total number of participants in group interviews was 6,772, for an average of 8.6 persons/group interview and a range from less than five persons in 3.8% of cases to 16 persons in one case (Table 3). In order to ascertain that 938 villages were not landmine-affected, a further 5,228 persons were consulted individually, for an average of 5.6 persons per community.

The average duration of the group interviews was 104 minutes, with a range from 15 to 250 minutes.

Group interviews were conducted in 31 languages. Portuguese was used exclusively in 76 (9.6%) group interviews and partially in a further 532 (67.3%) group interviews, but a significant number of group interviews was conducted exclusively in a language other than Portuguese[a], of which Macua (8.1%) was by far the most important. A total of 453 (57.3%) group interviews was conducted in a combination of two, and occasionally three, languages.

Obtaining accurate and comprehensive information about the location of SMAs and their socio-economic impacts by means of group interviews is best achieved if the Interviewees are representative of their communities with respect to such attributes as age, gender, and profession.

The representation of women among the Interviewees was less than would have been desired, partly for cultural reasons, but also because women tended to be working in the fields or otherwise occupied when the group interviews were held. Women constituted 1,189/6,772 (17.6%) Interviewees, but at least one woman participated in

[a] Ajaua (1), Barue (2), Bitonga (7), Changana (10), Chewa (2), Chimanica (1), Chope (2), Chuabo (7), Lomwe (13), Maconde (10), Macua (64), Manyaua, Matawara, Matonga, Munica (2), Ndau, Nharinga, Nyalingue, Nyanja (4), Nyungwe (6), Portuguese (76), Quimuani, Ronga, Sena (6), Shona (1), Swahili (3), Swazi, Teua, Xilolo, Xitswa (23), Zulu.

425/791 (53.7%) group interviews. In most cases where women were present, they participated actively in the group interviews.

The age composition of the Interviewees was: 1,600/6,465 (24.7%) of those whose age was recorded were aged between 15 and 29 years, 2,273 (35.2%) were aged between 30 and 44 years, 1,784 (27.6%) were aged between 45 and 59 years, and 808 (12.5%) were aged 60 years or more. Thus, it generally mirrored the national population structure (INE, 1998), except that persons aged 15-29 years were relatively under-represented. Collectively, the Interviewees can be assumed to have had a good recall of both periods of conflict and the subsequent years.

As is to be expected with interviews conducted predominantly in rural areas, 5,305/6,761 (78.5%) Interviewees who reported their profession were active in agriculture and other land-based activities, 533 (7.9%) were in primary- and secondary-sector activities such as mining and manufacturing activities (not necessarily in their home communities), 387 (5.7%) belonged to the defense and public sectors, 130 (1.9%) were inactive, 35 (0.5%) worked in the service sector, and 371 (5.5%) reported “other” activities.

LANDMINE-AFFECTED COMMUNITIES

In total 791 communities self-identified as landmine-affected. That number must be considered a minimum.

DISTRIBUTION

The widespread distribution of landmine-affected communities is striking (Figure 1).

The 791 landmine-affected communities identified are distributed throughout every Province: 123/128 (96.1%) Districts are landmine-affected; four (3.1%) Districts were reported as not being landmine-affected; and there are no data for one (0.8%) District, which was completely inaccessible. Above-average numbers of landmine-affected communities were identified in Inhambane, Maputo, and Zambézia provinces, while their numbers in Gaza, Niassa, Sofala, and Tete provinces were below the national average (Table 2).

The landmine problem is both urban and rural. Twenty-three landmine-affected communities, being 13 District seats and 10 seats of Administrative Localities, are classified as urban. They are concentrated in Maputo (nine) and Gaza (six) provinces, with smaller numbers in Inhambane (two), Sofala (two), Tete (one), and Nampula (three) provinces (Figure 1).

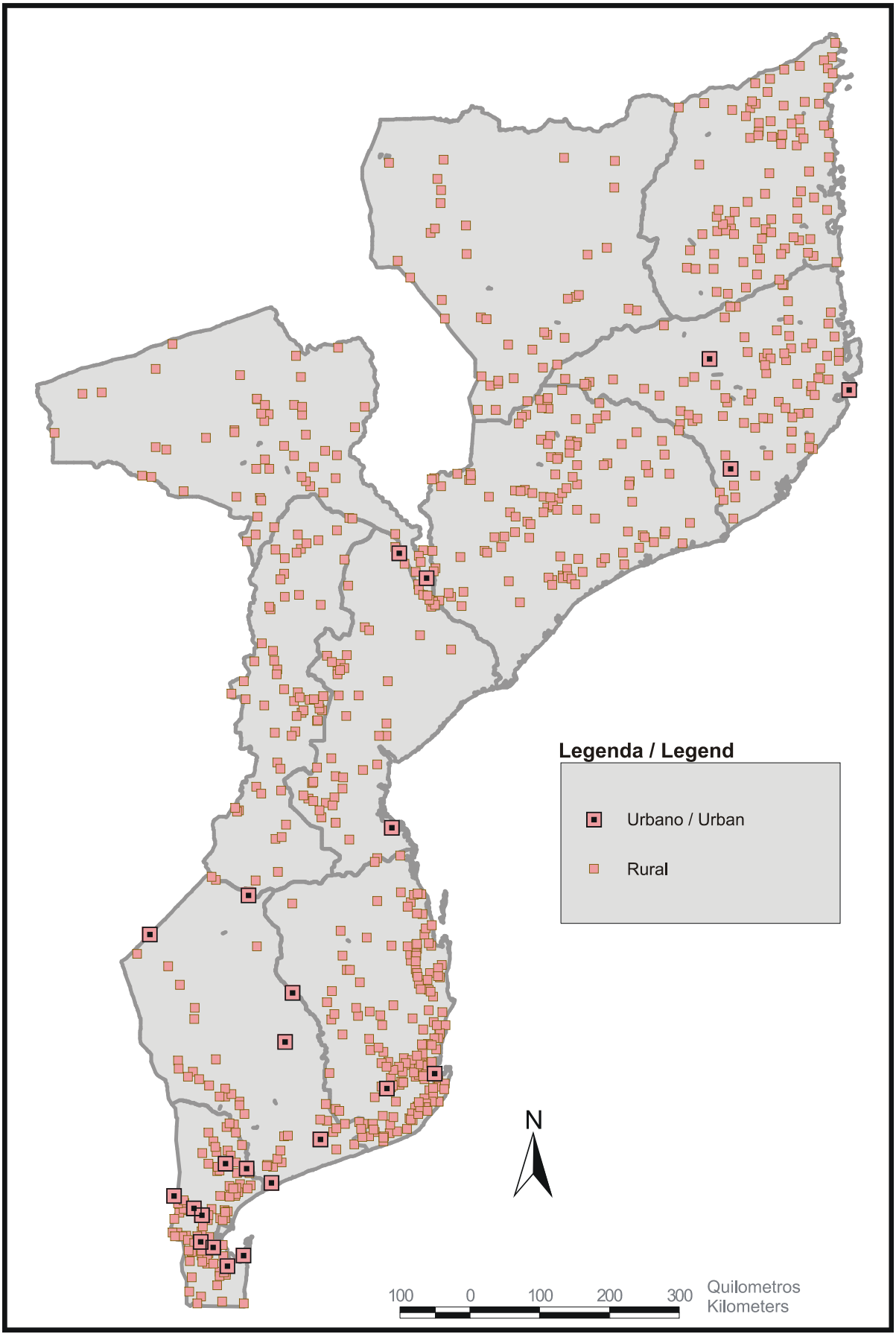
Of the 768 communities classified as rural that are landmine-affected, 708 (92.2%) are classified as villages, 14 (1.8%) as District seats, and 46 (6.0%) as the seats of Administrative Localities.

Table 4 LANDMINE-AFFECTED COMMUNITIES, BY POPULATION

Population Class	Number of Communities
0 - 500	167 (22.1%)[1]
501 - 1,000	154 (20.3%)
1,001 - 1,500	140 (18.5%)
1,501 - 2,000	105 (13.9%)
2,001 - 2,500	51 (6.7%)
2,501 - 3,000	37 (4.9%)
3,001 - 3,500	26 (3.4%)
3,501 - 4,000	14 (1.8%)
4,001 - 4,500	15 (1.9%)
4,501 - 5,000	8 (1.1%)
5,001 - 5,500	7 (0.9%)
5,501 - 6,000	4 (0.5%)
6,001 - 6,500	4 (0.5%)
6,501 - 7,000	2 (0.3%)
7,001 - 7,500	3 (0.4%)
7,501 - 8,000	2 (0.3%)
8,001 - 8,500	1 (0.1%)
8,501 - 9,000	1 (0.1%)
9,001 - 9,500	0
9,501 - 10,000	1 (0.1%)
10,001 - 30,000	12 (1.6%)
over 30,000	3 (0.4%)
Unknown	34
TOTAL	791

[1] Percent based on number of communities of known population

Figure 1 LANDMINE-AFFECTED COMMUNITIES



POPULATION AFFECTED

At least 1,488,590 persons, representing 9.0% of the 1997 population of Mozambique, live in landmine-affected communities. Several of the 34 landmine-affected communities for which a population total was not available are classified as urban, and they are likely to have large populations. The preceding total does not include transients and temporary residents.

Slightly over 40% of the landmine-affected communities with known populations have populations of less than 1,000 persons, and approximately 75% have populations of less than 2,000 persons (Table 4). Twelve landmine-affected communities have populations of between 10,000 and 30,000 persons. They are: Mandlacaze (Gaza Province); Ungana, Hanhane, Tevele, and Mucuacua (Inhambane Province); Namitarar and Mothi (Nampula Province); Boane and Zona G (Maputo Province); Nhamatani (Sofala Province); and Songo-Sede (Tete Province). Three landmine-affected communities have populations greater than 30,000 persons. They are Mafambisse-Sede (Sofala Province), Sancula/Jembesse (Nampula Province), and Maxixe (Inhambane Province).

Inhambane Province accounts for one quarter of all the persons affected by SMAs, and Cabo Delgado and Zambézia provinces together account for almost another quarter. Nevertheless, the number of persons affected in each of the other Provinces is considerable.

SUSPECTED MINED AREAS PER COMMUNITY

Over one half of the landmine-affected communities reported a single SMA, while only 6.3% reported four or more SMAs (Table 5).

Table 5 SUSPECTED MINED AREAS, BY COMMUNITY

Number of Suspected Mined Areas	Number of Communities
1	428 (54.1%)
2	225 (28.5%)
3	88 (11.1%)
4	31 (3.9%)
5	9 (1.1%)
6	7 (0.9%)
7	3 (0.4%)
TOTAL	**791**

DISTANCE TO SUSPECTED MINED AREAS

The majority of landmine-affected communities reported SMAs that are relatively close to them. In 333/1,374 (24.2%) cases, the SMAs reported were within or immediately adjacent to the built area of the community, while 68.9% of them were within four kilometers, and 93.7% were within 10 kilometers. Nevertheless, some communities reported SMAs as far away as 20.3 kilometers.

SUSPECTED MINED AREAS

Table 6 SUSPECTED MINED AREAS AND AFFECTED POPULATION, BY PROVINCE

Province	Number of Suspected Mined Areas	Affected Population
Cabo Delgado	166 (12.1%)	170,566 (11.4%)
Gaza	70 (5.1%)	90,766 (6.1%)
Inhambane	261 (18.9%)	373,033 (25.1%)
Manica	110 (8.0%)	89,823 (6.0%)
Maputo	184 (13.4%)	126,592 (8.5%)
Nampula	130 (9.5%)	178,152 (11.9%)
Niassa	62 (4.5%)	60,379 (4.1%)
Sofala	102 (7.4%)	134,156 (9.0%)
Tete	89 (6.5%)	93,596 (6.5%)
Zambézia	200 (14.6%)	171,527 (11.5%)
Total	**1,374**	**1,488,590**

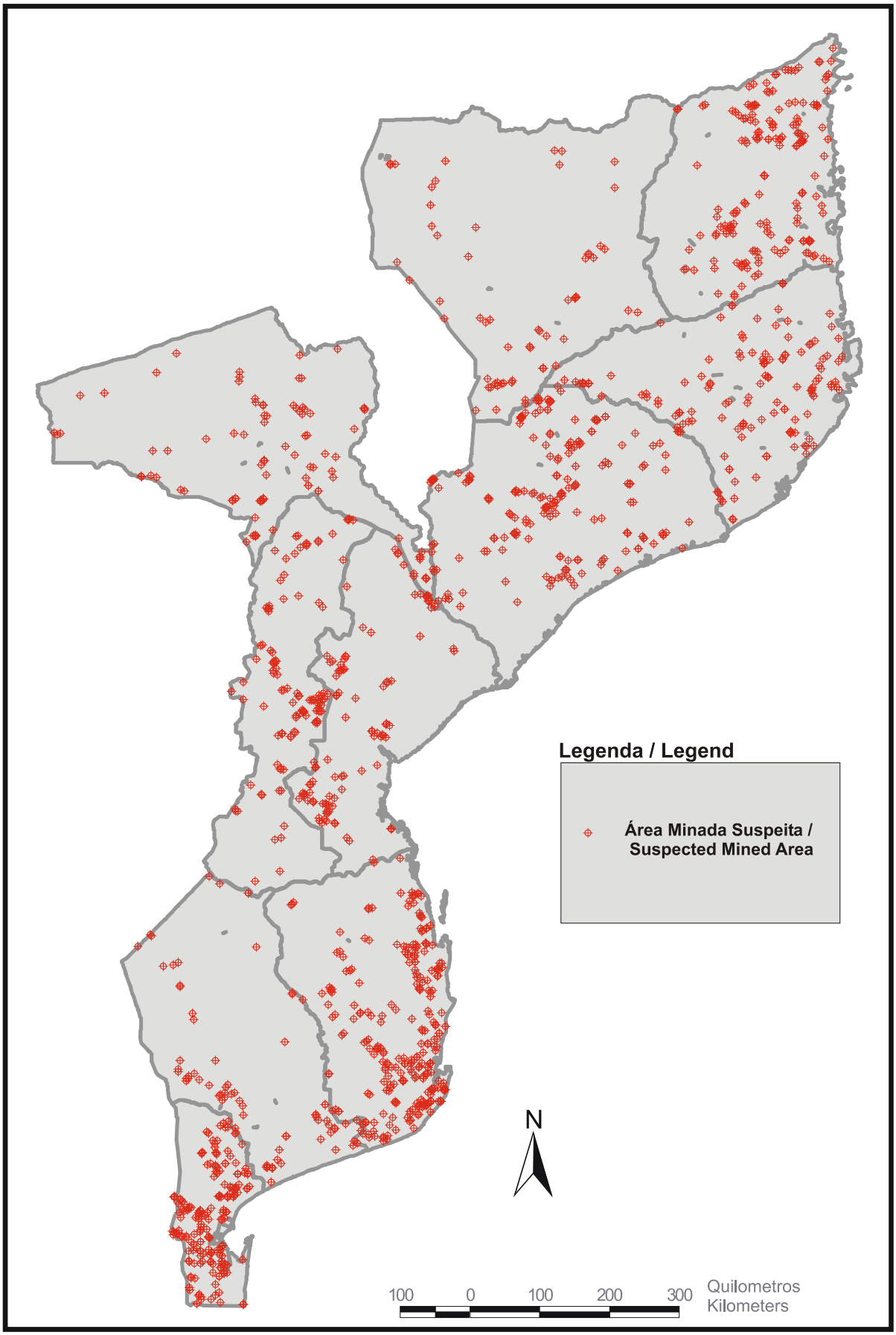
The 791 landmine-affected communities reported a total of 1,374 SMAs.

DISTRIBUTION

Like landmine-affected communities, SMAs affecting communities are found in every Province and virtually every District (Figure 2). They are particularly numerous in Inhambane and Zambézia provinces, present in above-average numbers in Maputo and Cabo Delgado provinces, and reported in below-average numbers in Gaza, Niassa, and Tete provinces (Table 6).

SMAs do not seem to be distributed randomly. In Cabo Delgado and Nampula provinces, for example, they seem to cluster close to major transportation infrastructure. Such appearances should, however, be treated with caution, for several reasons: the MLIS was designed to collect information only about SMAs that are currently affecting communities and may not therefore include mined areas that are not affecting communities; and the pattern revealed does not take into account the many mined areas that have been cleared since 1992, the compilation of data on which did not form part of the MLIS.

Figure 2 SUSPECTED MINED AREAS



AGE

The majority of the SMAs date from the Civil Conflict of 1976-1992. The dates when mines were first laid were reported for 802/1,374 (50.3%) SMAs, and 8.4% fall within the period of the Independence Struggle, between 1964 and 1975. The dates when mines were last laid were reported for 691/1,374 SMAs, including many of those for which the dates of first mine-laying had been reported. A total of 6.4% of those dates belong to the period of the Independence Struggle. SMAs dating from the Independence Struggle are concentrated in Cabo Delgado Province and to a lesser extent in Tete Province, with small numbers in Gaza, Manica, Nampula, Niassa, and Sofala provinces, and none in the remaining provinces.

Table 7 DATES OF FIRST AND LAST MINE-LAYING, 1975-1992

	First Mine-Laying		Last Mine-Laying	
Year	Number of SMAs	Cumulative Percentage	Number of SMAs	Cumulative Percentage
1975	2	0.3%	0	0
1976	4	0.8%	2	0.3%
1977	6	1.6%	5	1.1%
1978	0	1,6%	0	1.1%
1979	12	3.3%	5	1.9%
1980	13	5.0%	7	2.9%
1981	15	7.1%	13	4.9%
1982	82	18.2%	36	10.5%
1983	107	32.7%	70	21.3%
1984	89	44.8%	35	26.7%
1985	80	55.6%	41	33.1%
1986	88	67.6%	51	40.9%
1987	93	80.2%	79	53.2%
1988	69	89.6%	56	61.8%
1989	40	94.9%	35	67.2%
1990	11	96.5%	51	75.1%
1991	16	98.6%	43	81.8%
1992	10	100.0%	118	100.0%
Unknown	637	-	727	-
Total	**1,374**		**1,374**	

The majority of the SMAs reported were laid between 1982 and 1992 (Table 7), namely in the latter two thirds of the Civil Conflict.

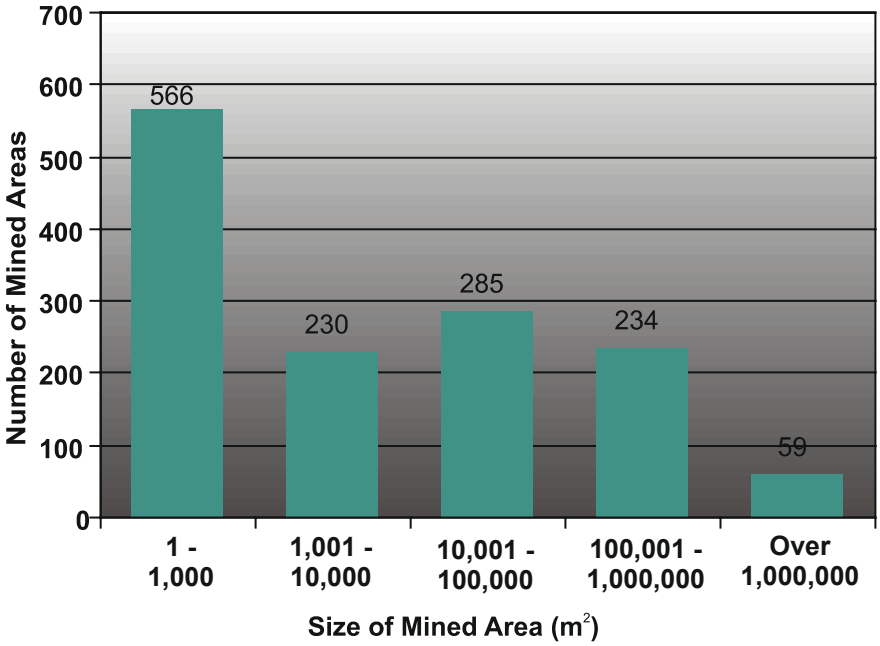
AREA

The total area of the SMAs is 561,689,063 m². Given the expected tendency of Interviewees, for reasons of personal safety, to overestimate the size of SMAs, the preceding figure may be overstated to an unknown degree.

Some 566 (41.2%) SMAs are less than 1,000 m², including 245 covering less than 10 m² that almost certainly contain only one or two landmines or items of UXO, and a further 125 covering between 10 m² and 100 m² that may also contain a small number of mines or items of UXO

(Figure 3). A total of 1,081 (78.6%) SMAs are less than 100,000 m², and 59 (4.3%) are larger than 1,000,000 m².

Figure 3 SIZE DISTRIBUTION OF SUSPECTED MINE AREAS



SMAs of each size category occur in each province with no clear indications of spatial clustering.

TYPES OF ORDNANCE

According to the Interviewees, 1,139 (82.8%) SMAs with a total area of 445,290,078 m² are contaminated by landmines only, while 168 (12.2%) with a total area of 82,757,987 m² are contaminated by UXO only, and 67 (4.9%) with an area of 33,640,998 m² are contaminated by both landmines and UXO.

MARKING

Less than 40% of SMAs by number and by area are marked in any way that might serve to reduce the likelihood of accidents (Table 8). Of those that are

Table 8 MARKING OF SUSPECTED MINED AREAS

Type of Marking	Number of SMAs	Area of SMA (m²)
Fenced	50 (3.6%)	28,301,912
Local Signs	141 (10.3%)	19,456,007
Official Signs	242 (17.6%)	160,613,030
Other Markings	61 (4.4%)	4,843,497
No Marking	861 (62.7%)	346,599,719
Unknown	19 (1.4%)	1,874,898
Total	**1,374**	**561,689,063**

marked, approximately 50% by number, and 28.6% by area, have official signs.

LANDFORM AND VEGETATION

Information on the landform and vegetation cover of SMAs is relevant to assessing techniques of clearing and to estimating required resources, costs, and duration.

In terms of number, 951/983 (96.7%) SMAs for which data are available occupy flat terrain, while the balance are on hills, ridges, or combinations thereof. The flat SMAs represent 98.9% of the area of the SMAs for which information on landform is available.

Tall and short grass and bush are the most important single classes of vegetation on SMAs, followed by bush and by trees (Table 9). Bearing in mind that only 33,860,105 m² of the SMAs described as having mixed vegetation are reported to have some trees, the dominant vegetation cover of the SMAs, probably of the order of 86% by area, is bush and grasses of various types.

Table 9 VEGETATION COVER OF SUSPECTED MINED AREAS

Vegetation Type	Number of SMAs	Area of SMAs (m²)
Bush	94 (6.8%)	32,426,488 (5.8%)
Short Grass	210 (15.3%)	60,569,476 (10.8%)
Tall Grass	138 (10.1%)	156,789,579 (27.9%)
Trees	89 (6.5%)	43,479,632 (7.7%)
Mixed	797 (58.0%)	266,143,239 (47.4%)
None	27 (1.9%)	127,032 (<0.1%)
Unknown	19 (1.4%)	2,153,617 (0.4%)
otal	**1,374**	**561,689,063**

FUNCTIONAL CLASSIFICATION

Table 10 FUNCTIONAL CLASSIFICATION OF SUSPECTED MINED AREAS

Functional Category	Number of SMAs
Military Installation	179 (13.0%)
Well	45 (3.3%)
Bridge	58 (4.2%)
Village Perimeter	65 (4.7%)
Trail	189 (13.8%)
Road	177 (12.9%)
Unknown/Unclassifiable	661 (48.1%)
Total	**1,374**

Understanding the purpose for which mines were originally laid can sometimes assist in determining priorities for clearance. For example, mines laid to protect a former military installation may have fewer current impacts on communities than those laid around the perimeter of a community or a well. Roads, trails and former military installations are the most numerous of the functional categories to which SMAs could

be assigned, but wells, bridges and village perimeters are all important (Table 10).

VICTIMS

Table 11 NUMBER OF VICTIMS

Category	Number of Communities	Number of Victims
Recent[1]	77	172
Non-Recent	403	1973
Total	429	2145
No Victims	319	-

[1] Within the two years preceding the group interview

The Interviewees reported 172 "recent" victims in the two years preceding the group interview, and 2,145 total victims since the start of the Independence Struggle, in 1964 (Table 11). Recent or older victims were reported by 472 (59.7%) landmine-affected communities.

The number of total victims must be considered a minimum, since 31 communities reported "many" victims but could not estimate even an approximate number, making it impossible to include their information in the IMSMA database. A further 12 communities did not know whether there had been any victims. If each of those communities had experienced the average number of victims reported by the communities that could identify a precise number, the number of total victims would increase to over 2,300. Only two communities did not know whether there had been any recent victims.

VICTIMS BY COMMUNITY

The distribution of the number of total victims by community is not random. One (0.2%) of the 472 communities that reported victims accounted for 160/2,124 (7.5%) of the total victims, and 49/472 (10.4%) of those communities accounted for (46.2%) of the total victims (Table 12).

Similarly, one (1.3%) of the 77 communities that reported recent victims accounted for 14.5% of those victims, while the eight (10.4%) communities that reported more than three recent victims accounted for 38.4% of the total (Table 13).

Table 12 NUMBER OF TOTAL VICTIMS, BY COMMUNITY

Number of Total Victims	Number of Communities
0	319
1	124
2	65
3	66
4	44
5	31
6	17
7	15
8	10
9	8
10	11
11	8
12	4
13	4
14	2
15	1
16	1
19	3
20	1
21	1
23	2
24	1
25	2
28	1
29	1
30	1
31	1
40	2
49	1
160	1
Unknown	43
Total	**791**

Table 13 NUMBER OF RECENT VICTIMS, BY COMMUNITY

Number of Recent Victims	Number of Communities
0	710
1	45
2	11
3	13
4	2
5	3
8	1
10	1
25	1
Unknown	4
Total	**791**

DISTRIBUTION

Victims were recorded in every province (Figure 4). Concentrations of total victims occur in Maputo and eastern Inhambane provinces. Total victims are widely distributed throughout Zambézia Province, the eastern parts of Nampula and Cabo Delgado provinces, and the northern area of Manica Province (Figure 4). Despite the presence of landmine-affected communities, total victims are not very common in northern Gaza, northwestern Inhambane, northern Sofala, northwestern Tete, and north-central Niassa provinces (Figure 4).

The overall distribution of recent victims mirrors that of total victims, but their incidence is relatively greater in Nampula, southern Cabo Delgado and eastern Tete provinces, as well as in southern Maputo and southeastern Inhambane provinces (Figure 5).

AGE AND SEX

Information on the age or sex of 108 recent victims was collected (Table 14). Men outnumbered women by a factor of almost three to one. A similar imbalance in favour of men was also reported in an earlier study (Sheehan and Croll, October 1993). Members of all age classes were represented, but the most frequently represented age groups were from 30 to 59 years among women (62.1% of female victims) and from 15 to 44 years among men (57.4% of male victims).

Table 14 AGE AND SEX OF RECENT VICTIMS

Age	Female	Male	Sex Unknown
under 5 years	2 (6.9%)	0	
5 - 14	2 (6.9%)	10 (13.3%)	2 (4.8%)
15 - 29	4 (13.8%)	20 (26.7%)	
30 - 44	10 (34.5%)	23 (30.7%)	
45 - 59	8 (27.6%)	12 (16.0%)	1 (2.4%)
over 59 years	1 (3.4%)	6 (8.0%)	1 (2.4%)
Unknown	2 (6.9%)	4 (5.4%)	37 (90.2%)
Total	**29 (100.0%)**	**75 (100.0%)**	**41 (100.0%)**

Figure 4 TOTAL VICTIMS

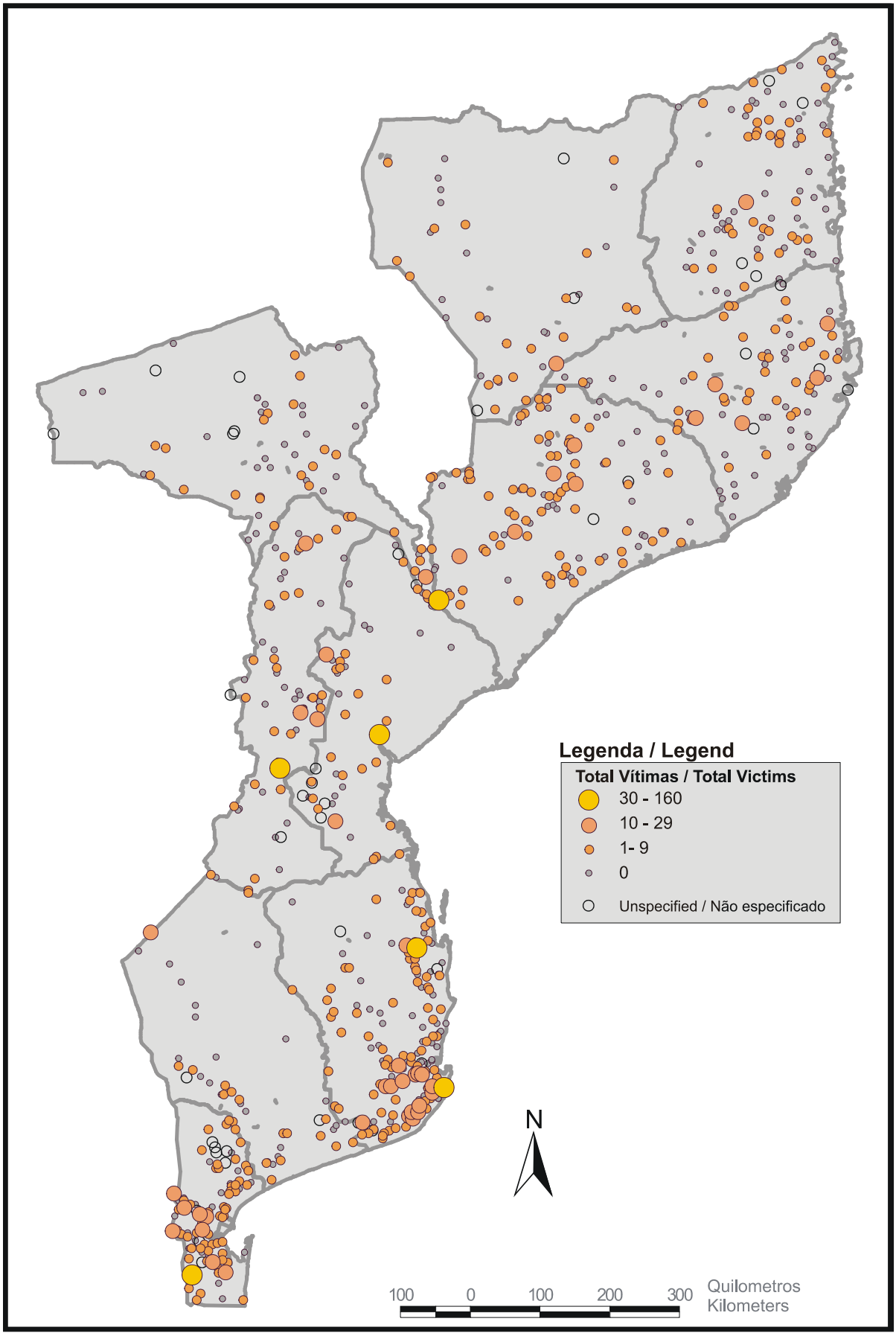
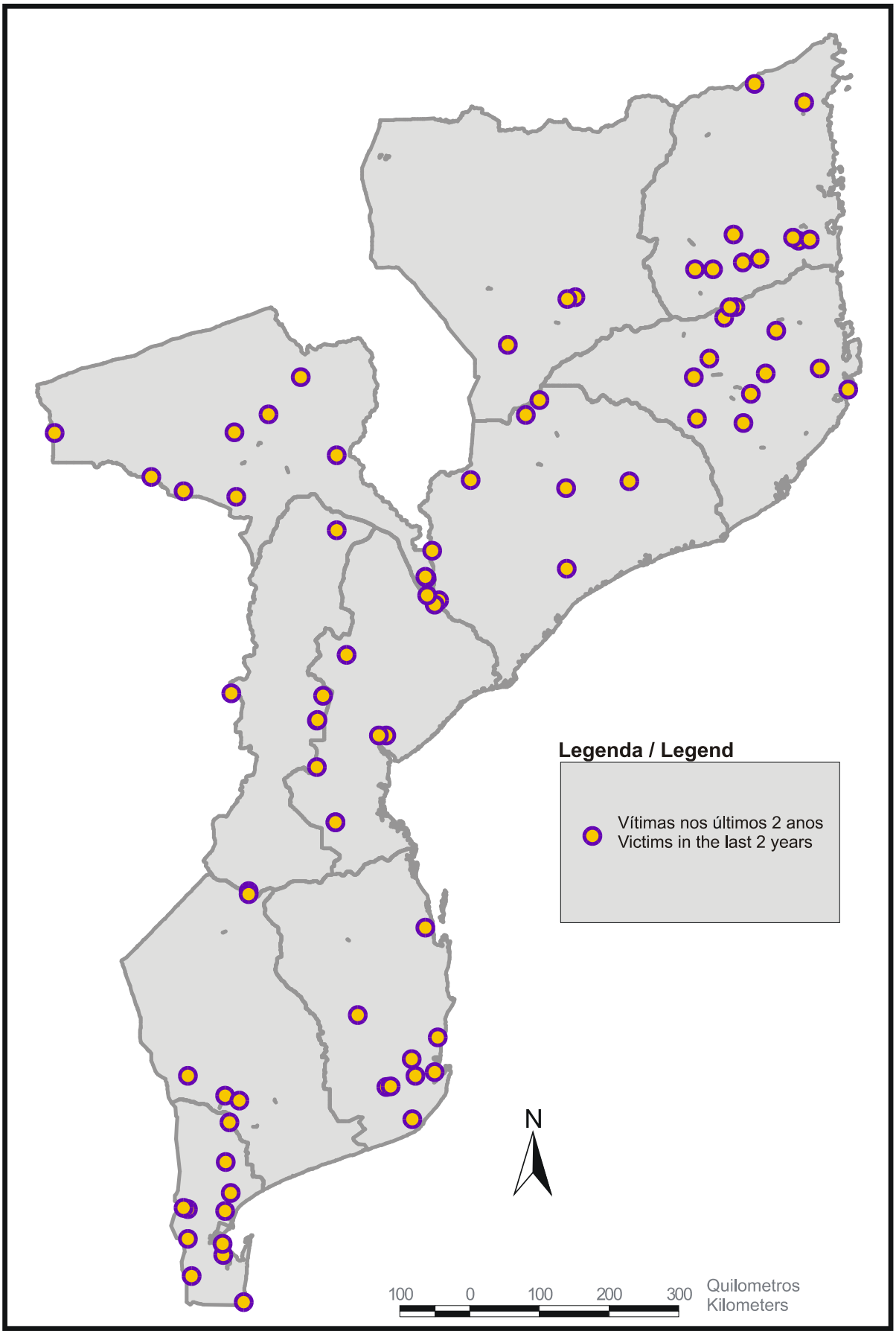


Figure 5 RECENT VICTIMS



CONSEQUENCES OF ACCIDENTS

Almost one third of the recent accidents proved to be fatal, while one quarter resulted in amputation or loss of vision (Table 15).

Table 15 CONSEQUENCES OF RECENT ACCIDENTS

Consequence	Number of Victims
Amputation	38 (22.1%)
Amputation & Loss of Vision	2 (1.2%)
Fatal	53 (30.8%)
Loss of Vision	3 (1.7%)
Other Wound	12 (6.9%)
Unknown	64 (37.2%)
Total	**172**

ACTIVITIES

The majority (71.3%) of recent accidents of known causes occurred when the victims were involved in economic activities, while accidents during travel (6.9%) and tampering (0.9%) were rare (Table 16). The association between accidents and the types of economic activities often thought to be performed by women cannot easily be reconciled with the significantly higher frequency of men as victims of accidents without further research.

Table 16 ACTIVITY OF RECENT VICTIMS AT TIME OF ACCIDENT

Activity	Number of Victims
Collecting food/water	44 (25.6%)
Farming	15 (8.7%)
Herding	9 (5.2%)
Household work	4 (2.3%)
Playing	9 (5.2%)
Tampering	1 (0.6%)
Traveling	7 (4.1%)
Other	12 (6.9%)
Unknown/Not Recorded	71 (41.4%)
TOTAL	**172**

CIVIL STATUS

Only 2/102 (1.9%) of recent accidents for which such information was collected involved military personnel.

BLOCKAGE IMPACTS

Table 17 presents an overview of the blockage impacts reported. The totals in Table 17 cannot be summed, since a single community may have reported several types of blockage impact, and each SMA may also be responsible for several types of blockage.

By every criterion used, blocked access to rainfed cropland is the most important impact of SMAs, being caused by 760 (55.3%) SMAs, and affecting 464 (58.7%) of the landmine-affected communities and a total of over 940,000 persons. Blocked access to roads is also a problem for many (231, or 29.2%) communities and a large number of persons (368,610), the more so since the cases reported reflect situations where satisfactory alternative roads have not been built in the nine years since the cessation of the Civil Conflict. Blocked access to non-agricultural land, which is a source of game, edible and medicinal plants, firewood, and building materials, affects 180 (22.7%) communities and over 290,000 persons and must also be considered to be a serious problem. Although it does not occur as frequently as and affects fewer persons than most other blockage impacts, blocked access to drinking water must be considered to be a very serious impact on account of its implications for human health and the additional burden that fetching water from other sources undoubtedly places on women and girls.

Table 17 OVERVIEW OF BLOCKAGE IMPACTS

Blockage Impact	Communities	Population	Number of SMAs	Area SMAs (m²)
Rainfed Cropland	464	941,547	760	369,081,414
Pasture	91	143,291	144	70,689,960
Non-drinking Water	82	124,646	99	36,253,627
Drinking Water	55	87,221	70	13,784,317
Non-agricultural Land	180	291,049	281	136,854,458
Roads	231	368,610	358	104,773,441
Infrastructure	96	238,745	130	46,533,910
Service points	49	63,179	51	10,938,557

The following principal observations can be made about the distribution of reports of blockage impacts:

- Reports of blocked access to rainfed cropland were widespread except in northern Niassa, northern Gaza, western Tete, and western and southeastern Nampula provinces (Figure 6).
- Blocked access to pasture was mentioned almost exclusively in Tete, Manica, and the southern provinces (Figure 7), presumably because the tsetse fly renders much of northern Mozambique unsuitable for herding cattle.
- Blocked access to non-agricultural land was widely reported, except in western and central Nampula, north-central Niassa, northern Gaza, and northwestern Inhambane provinces (Figure 8).
- Blocked access to drinking water was reported most often in Maputo and Inhambane provinces, but it was also relatively frequent in Zambézia, Nampula and Cabo Delgado provinces, and occurred at least once in each of the remaining provinces (Figure 9).
- Blocked roads and paths were not reported in Niassa and Cabo Delgado provinces. Such reports were rare in Nampula and Tete provinces, but they increased in frequency towards the south (Figure 10).
- Reports of blockages to infrastructure were most numerous in central Zambézia, Inhambane, and southern Maputo provinces, but they occurred in every province (Figure 11).

The Interviewees in 187 (23.6%) landmine-affected communities reported no current blockage impacts. We cannot know whether such impacts have never existed, or whether they have disappeared since the end of the most recent period of conflict, in 1992, as solutions to them have been identified and implemented. Even where the Interviewees perceive no current impacts, however, the SMAs remain unusable, unproductive, and potentially dangerous.

Figure 6 BLOCKED ACCESS TO AGRICULTURAL LAND

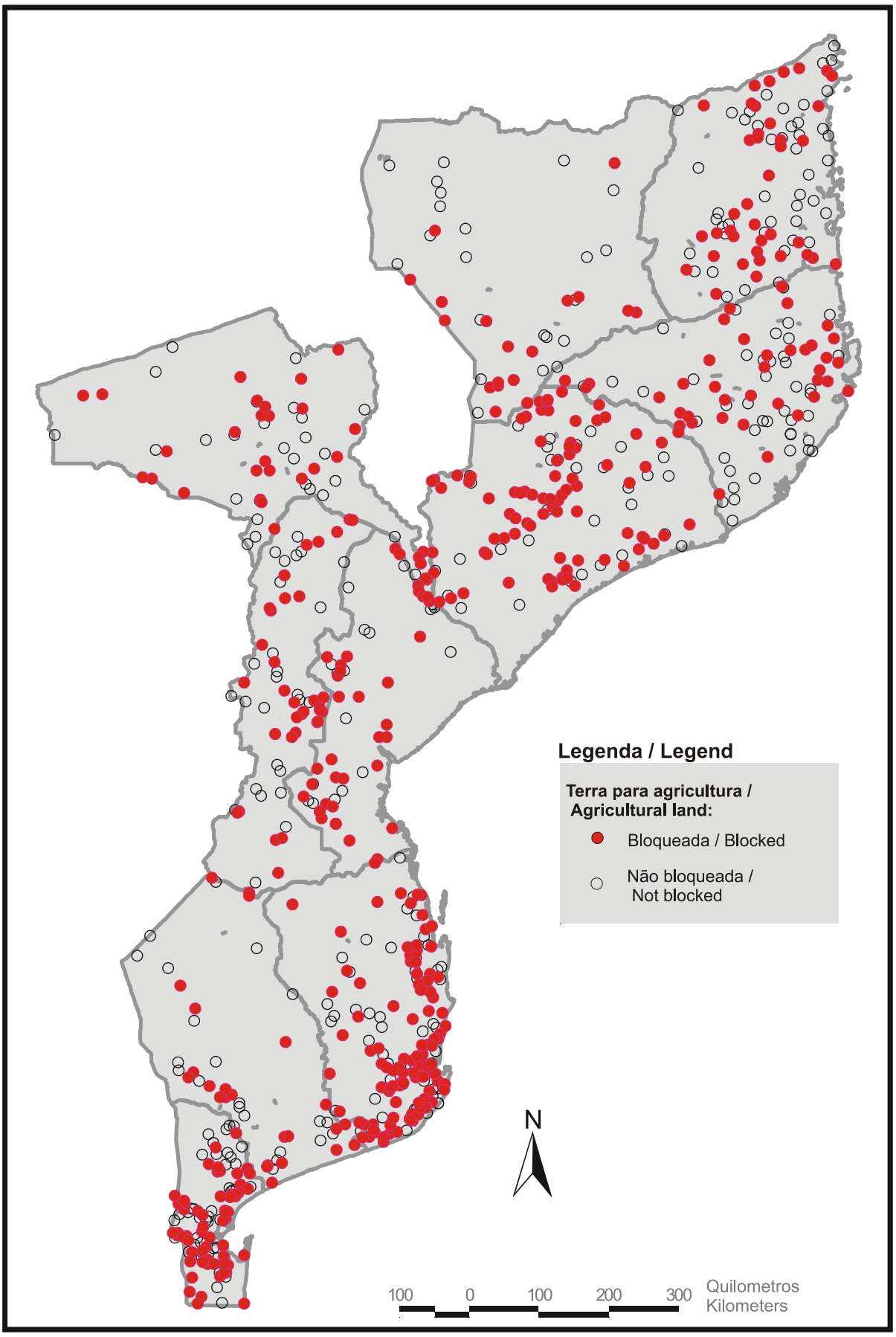


Figure 7 BLOCKED ACCESS TO PASTURE

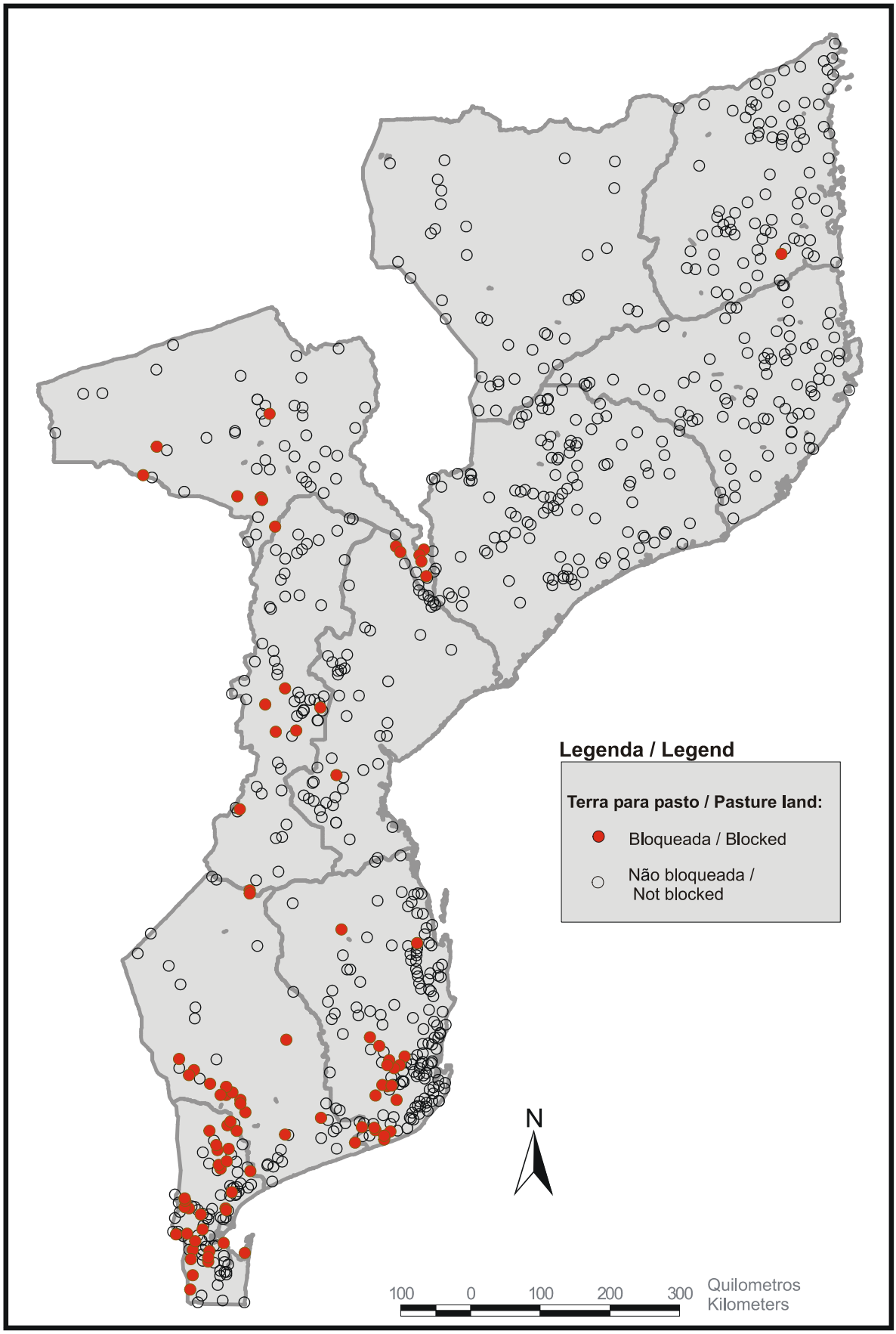


Figure 8 BLOCKED ACCESS TO NON-AGRICULTURAL LAND

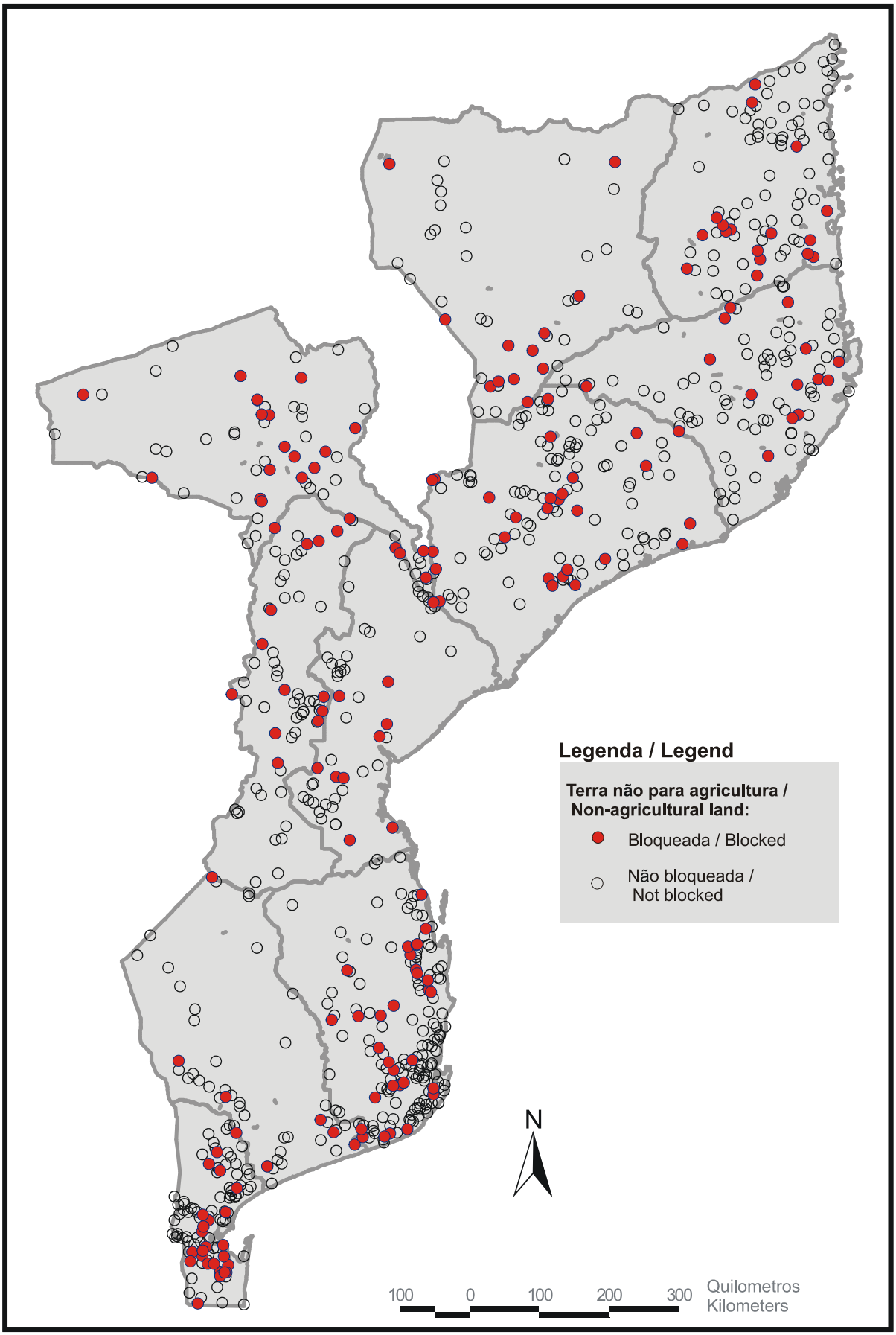


Figure 9 BLOCKED ACCESS TO DRINKING WATER

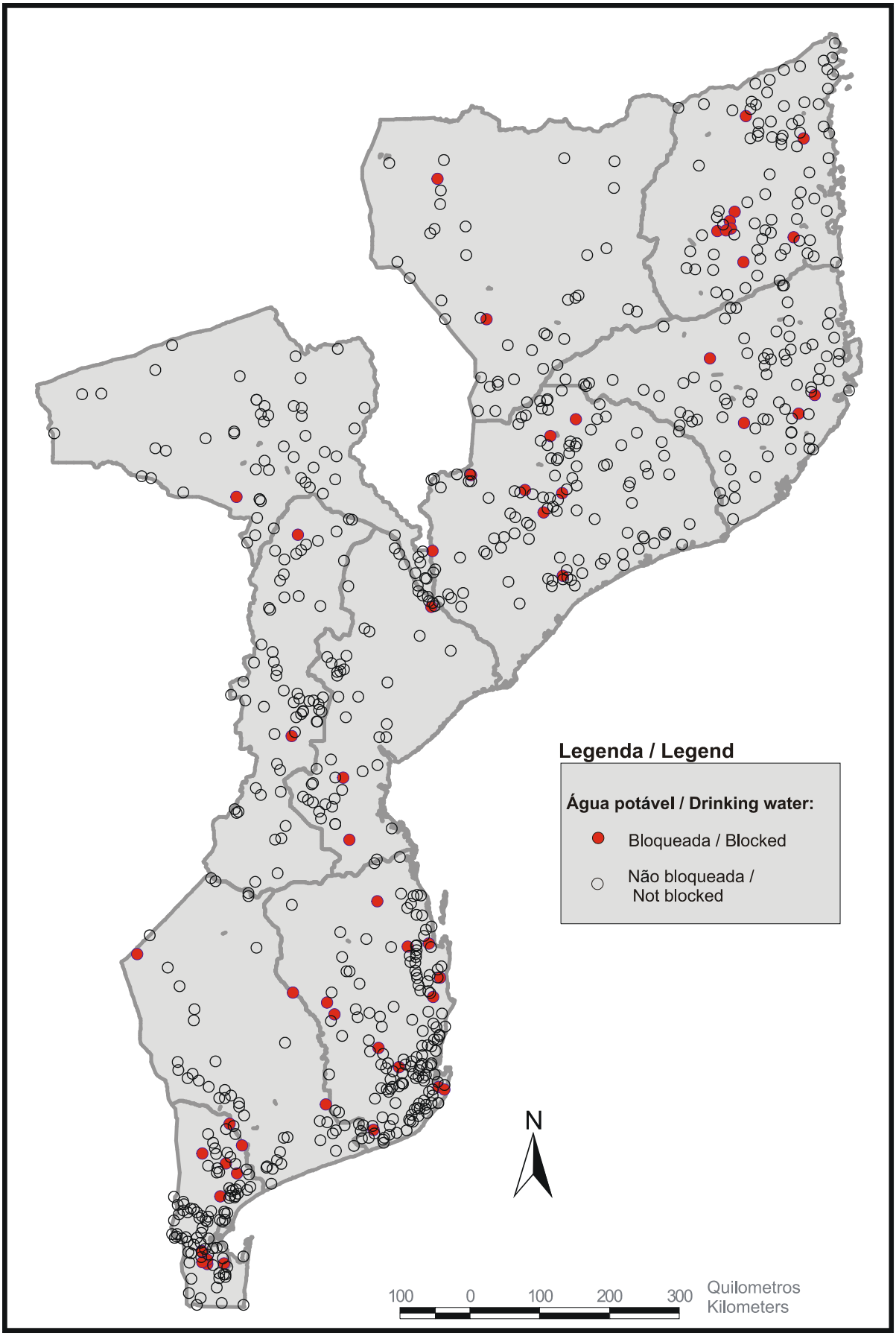


Figure 10 BLOCKED ACCESS TO ROADS

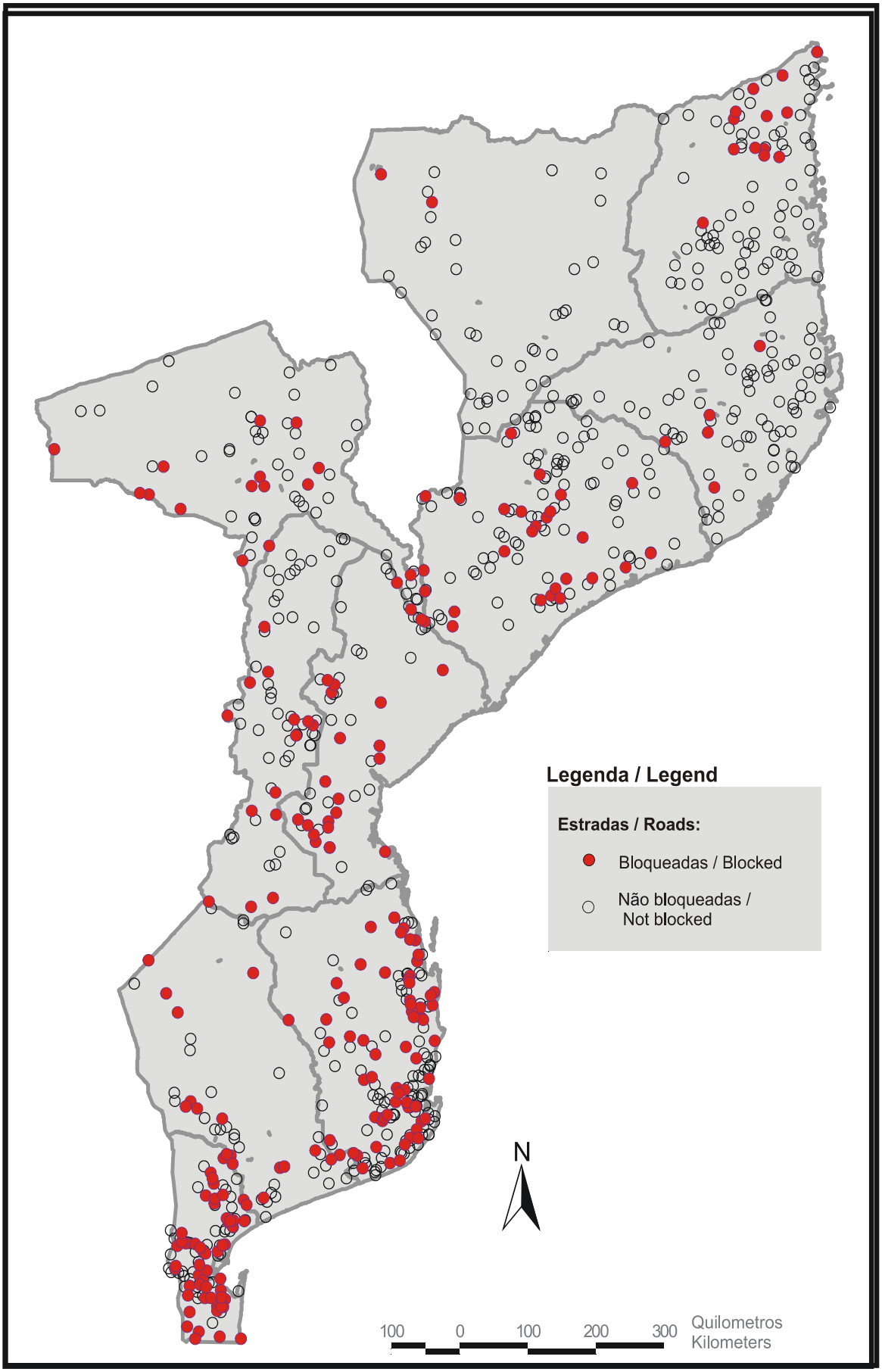
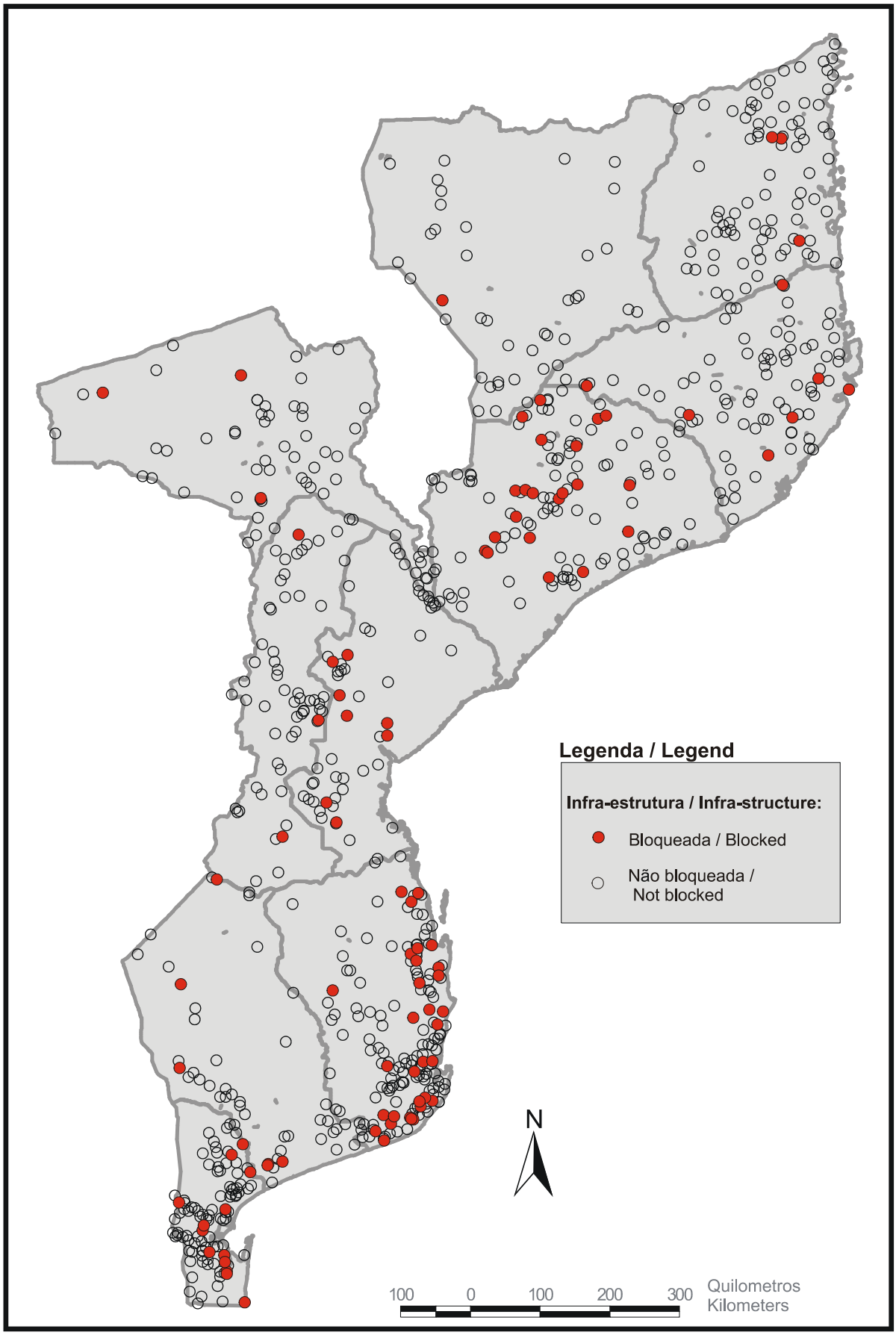


Figure 11 BLOCKED ACCESS TO INFRASTRUCTURE



PSYCHOLOGICAL/BEHAVIORAL IMPACTS

A total of 6,101/6,772 (90.1%) Interviewees provided information on the psychological impacts of landmines on themselves. The majority worry about landmines a great deal (73.5%) or moderately (5.2%), while 11.1% worry a little, 5.9% do not worry at all, 3.9% do not consider the issue applicable to them, and a very few do not know whether they worry.

In sum, 6,070/6,772 (89.6%) Interviewees provided information on whether worry about landmines causes them to modify their behavior. The majority asserted that they modify their behavior a great deal (63.0%) or moderately (8.3%). A total of 8.8% stated that they do not change their behavior out of fear of landmines, 12.7% replied that they modify their behavior a little, 6.5% considered the question to be inapplicable to them, and the remainder (0.7%) claimed not to know.

Table 18 LOSSES OF ANIMALS, BY SPECIES

Species	Number of Events	Number of Communities
Cattle	244	77
Dogs	2	2
Goats	>138	18
Horses	1	1
Monkeys	1	1
Others	>44	16
Pigs	45	28
Unspecified	Unspecified	5
TOTAL	>475	148

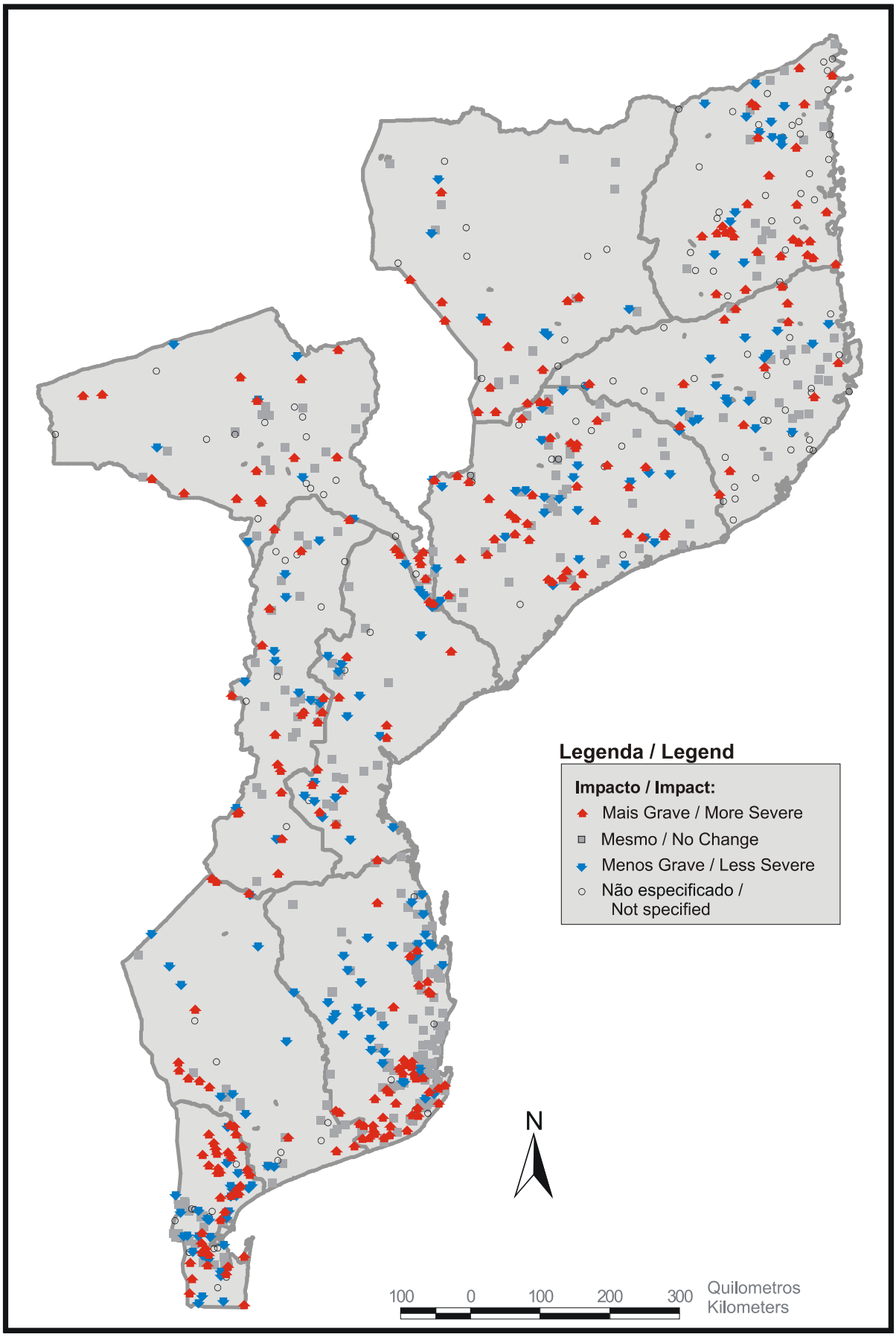
LOSSES OF ANIMALS

A total of 148 communities reported losing animals to landmines (Table 18). The greatest number of such events involved cattle, but important losses of goats and pigs were also reported. Losses of animals, especially cattle, were most numerous in Maputo, Gaza, and Inhambane provinces. Most of the losses in Zambézia, Nampula, Cabo Delgado, and Niassa provinces involved pigs.

IMPACT TRENDS

The Interviewees in 663 (83.8%) communities provided information on trends in the severity of impacts. Roughly equal numbers thought that the impacts of landmines are becoming more severe (35.6%) and that they are unchanged in severity (38.2%), while 26.2% believed that their severity is declining. The belief that the severity of impacts is increasing is widely dispersed in all of the provinces except Gaza Province, where it is concentrated in the southwest, and in Inhambane Province, where it is concentrated in the southeastern and coastal regions (Figure 12).

Figure 12 IMPACT TRENDS



The belief that impacts are increasing in severity despite the passing of almost 10 years since landmines were last laid may appear counter-intuitive. On the other hand, large numbers of refugees and internally displaced persons have returned since the end of the Civil Conflict, population has grown, and economic activity has expanded. It is reasonable to suppose, therefore, that blockage impacts that were non-existent or minor some years ago are taking on greater importance with the passing of time as pressure on land increases.

SEASONALITY OF IMPACTS

In total, 649/791 (82.1%) of landmine-affected communities reported that there is no season at which the impacts of landmines are greater than at other seasons, while 24 (3.1%) either did not know or considered the question inapplicable.

The majority of the communities that reported seasonal variation distinguished between wet and dry seasons. Some 71 (8.9%) reported that impacts are greater during the wet season (corresponding roughly to the period from December to April), citing such reasons as that pools of water and the lush vegetation make landmines difficult to see, that the soft soil allows landmines to move closer to the surface, that flood waters displace them, and the need to cultivate larger areas during the wet season. The 32 (4.0%) communities that reported that the impacts of landmines are greater during the dry season cited such causes as the need to take animals to water sources that are not used at other seasons, the requirement to hunt over large areas, and preparing the soil for planting.

Two (0.3%) communities identified winter, which corresponds roughly to the dry season, as the season of greatest impact, citing the need to collect wood for fuel and the preparation of the soil for planting. Finally, 13 (1.6%) communities identified summer as the season of greatest impact, essentially for the same reasons as those identified by other communities for the wet season.

MINE IMPACT SCORE

The manner in which the Mine Impact Score is calculated and the weightings used are described elsewhere. Ranked according to the MIS, 20 (2.5%) communities belong to the high-impact category, 164 (20.7%) to the medium-impact category, and 607 (76.7%) to the low-impact category (Table 19). The population of the high-impact communities is at least 36,254 persons, that of the medium-impact communities at least 393,406 persons, and that of the low-impact communities no less than 1,058,930 persons.

Table 19 MINE IMPACT SCORES AND CLASSIFICATION, BY COMMUNITY

Impact Category	Mine Impact Score	Number of Communities[1]	Population
High			
	11	6 (0.8%)	7 932 (0.5%)
	12	2 (0.2%)	3 591 (0.2%)
	13	5 (0.6%)	6 202 (0.4%)
	14	1 (0.1%)	1 563 (0.1%)
	15	3 (0.4%)	9 134 (0.6%)
	22	1 (0.1%)	1 037 (0.1%)
	26	1 (0.1%)	3 457 (0.2%)
	52	1 (0.1%)	3 338 (0.2%)
	Sub-total	**20 (2.5%)**	**36 254 (2.3%)**
Medium			
	6	70 (8.9%)	129 273 (8.7%)
	7	46 (5.8%)	58 472 (3.9%)
	8	25 (3.2%)	168 752 (11.3%)
	9	15 (1.9%)	25 650 (1.7%)
	10	8 (1.0%)	11 259 (0.8%)
	Sub-total	**164 (20.7%)**	**393 406 (26.4%)**
Low			
	1	32 (4.1%)	38 292 (2.6%)
	2	155 (19.6%)	278 339 (18.7%)
	3	92 (11.6%)	159 800 (10.6%)
	4	186 (23.5%)	367 640 (24.7%)
	5	142 (17.9%)	214 859 (14.4%)
	Sub-total	**607 (76.7%)**	**1 058 930 (71.1%)**
TOTAL		**791**	**1 488 590**

[1] Includes some communities with unknown populations

With the exception of Niassa Province, there is at least one high-impact community in each Province (Table 20). The greatest number of high-impact communities is found in Nampula Province; but there is relatively little variation among Provinces. Particularly high numbers of medium-impact communities occur in Inhambane and Maputo provinces, and only Niassa Province has significantly fewer than the national average.

The major clusters of impact categories by Province are: high-impact communities in central Nampula Province (Figure 13) and near the Sofala-Tete-Zambézia-Malawi borders; medium-impact communities in southeastern and coastal Inhambane Province and throughout Maputo Province, in north-central Zambézia, south-east Niassa, on or near the Tete-Zimbabwe border, and in east-central Manica provinces; and low-impact communities in Maputo, Inhambane and Zambézia provinces.

Table 20 MINE IMPACT SCORE CLASSIFICATION, BY PROVINCE

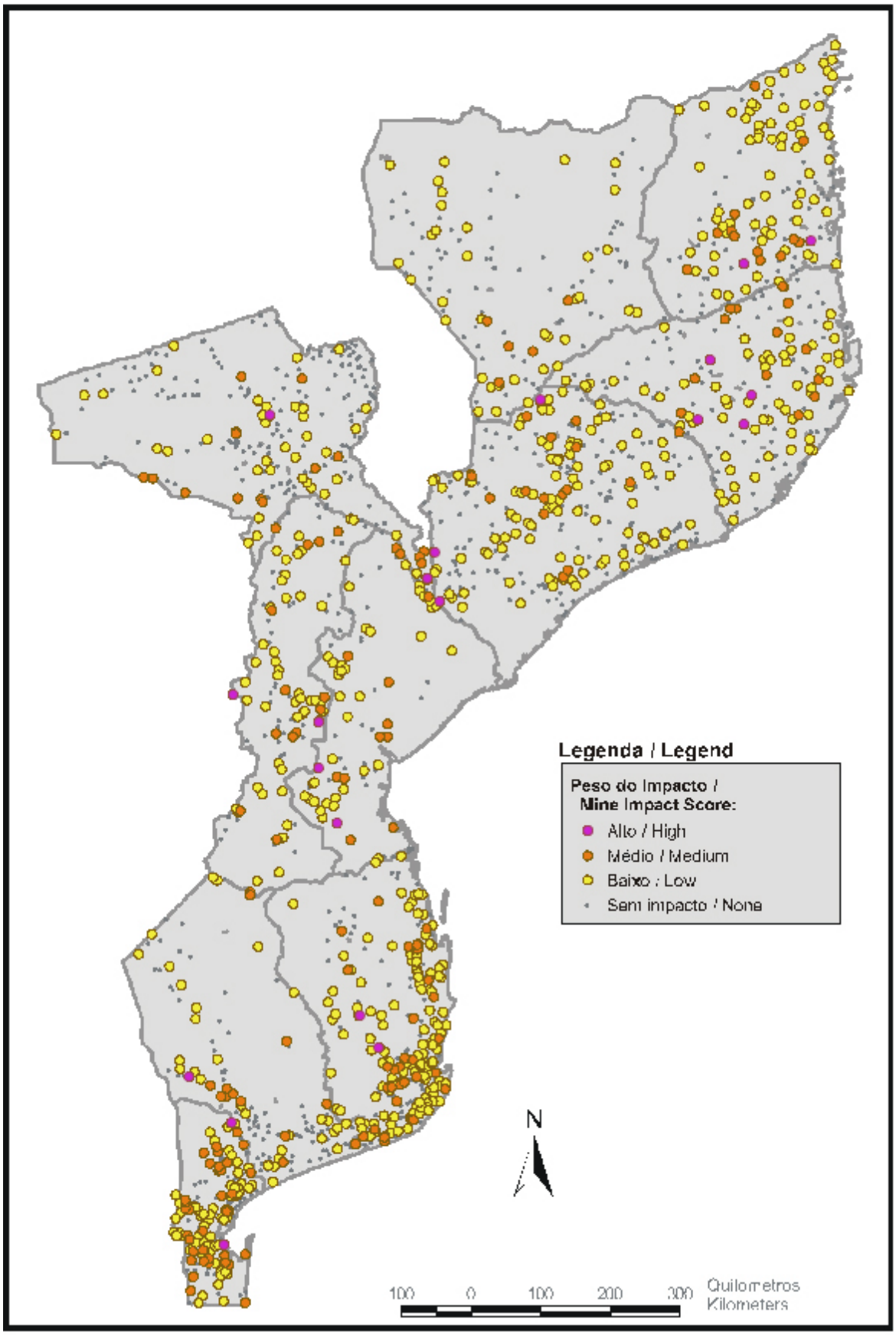
Province	Impact Category	Number of Communities
Cabo Delgado	High	2 (10.0%)
	Medium	12 (7.3%)
	Low	70 (11.5%)
Gaza	High	1 (5.0%)
	Medium	12 (7.3%)
	Low	33 (5.4%)
Inhambane	High	2 (10.0%)
	Medium	30 (18.3%)
	Low	125 (20.6%)
Manica	High	2 (10.0%)
	Medium	13 (7.9%)
	Low	45 (7.4%)
Maputo	High	2 (10.0%)
	Medium	35 (21.3%)
	Low	63 (10.4%)
Nampula	High	4 (20.0%)
	Medium	13 (7.9%)
	Low	64 (10.5%)
Niassa	High	0
	Medium	5 (3.1%)
	Low	35 (5.8%)
Sofala	High	2 (10.0%)
	Medium	13 (7.9%)
	Low	37 (6.1%)
Tete	High	2 (10.0%)
	Medium	16 (9.8%)
	Low	40 (6.6%)
Zambézia	High	3 (15.0%)
	Medium	15 (9.2%)
	Low	95 (15.6%)
Total		**791**

The Mine Impact Score assigns particular weight to recent victims of landmine accidents. Several recent victims, or a combination of recent victims and blockage impacts, are required for a community to be assigned to the high-impact category.

The Mine Impact Score is a valuable tool. The SAC, which devised the Mine Impact Score, has also taken the lead in evaluating it (Benini, 22 October 1999). It has described it accurately as … *a qualitative and compassionate construct*…and has concluded tentatively that it … *has little value for cost-benefit concerns in demining*…, but that it … *does better for accident reduction*…

Except in the improbable event that large numbers of recent victims are widespread, the Mine Impact Score assigns a large number of landmine-affected communities to the low-impact category. The need has therefore been expressed in Mozambique for a tool that would assist in establishing priorities among those low-impact communities. Some approaches are discussed below.

Figure 13 MINE IMPACT SCORE



Discussion

The preceding findings must be interpreted in the light of the objectives that the MLIS was designed to achieve. It was designed primarily to gather information on the perceptions of the residents of landmine-affected communities of the current impacts of SMAs on themselves and their communities. There are, therefore, aspects of the landmine situation in Mozambique on which the MLIS cannot be expected to cast light, including: the location of mined areas that do not impact communities; the impacts of mined areas near communities but that do not affect them, such as blocked access to electricity transmission or water pipelines that do not service the adjacent communities; and victims of landmines – such as persons crossing borders illegally – who are not affiliated with or known to any community.

Because of the foregoing, comparing the findings of the MLIS with other sources or types of data about landmines must proceed with particular caution. Conventional wisdom may suggest that the landmine situation is particularly acute in one Province, whereas the MLIS may paint a different picture. That is not to say that one view is "true" and the other is "false", or that either one is "better" than the other. Rather, different approaches should yield complementary perspectives, all of which need to be integrated into the preparation of a mine-action plan, giving to each type of data the weight that reflects the priorities of the planning agency or the concerned governmental authorities.

The principal product of the MLIS is not this report but the populated IMSMA database that has been transferred to the IND. Even that populated database is not, however, a static end-product: the impact data from the MLIS should be updated periodically as further information becomes available and as formerly inaccessible areas become accessible; further analysis may be desired; and the data should be used, together with data from the full range of other available sources, to formulate action plans.

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APPENDIX I: District Overview of Principal Findings

Province	District	Affected Villages	Unaffected Villages	Affected Population	Number of SMAs	Victims in Last 2 Years	Total Victims
CABO DELGADO							
	ANCUABE	9	4	22,163	16	7	15
	BALAMA	3	2	6,382	4	1	1
	CHIURE	10	6	20,971	23	3	8*
	MACOMIA	4	4	4,433	5	0	1
	MECUFI	1	1	4,006	2	0	0
	MELUCO	5	4	5,427	10	0	19
	MOCIMBOA DA PRAIA	5	1	5,094	11	0	1*
	MONTEPUEZ	11	7	13,732	18	1	10
	MUEDA	13	3	24,334	32	1	18
	MUIDUMBE	7	0	26,109	16	0	17
	NAMUNO	3	8	4,056	4	1	1
	NANGADE	4	1	12,914	10	0	5*
	PALMA	6	1	18,120	10	0	3
	PEMBA-METUGE	0	3	-	-	-	-
	QUISSANGA	3	5	2,825	5	0	3
	Total	**84**	**50**	**170,566**	**166**	**14**	**102**
GAZA							
	BILENE MACIA	7	11	9,065	10	0	12
	CHIBUTO	2	12	5,692	2	0	2
	CHICUALACUALA	6	13	11,561	10	0	14
	CHIGUBO	3	2	564	5	0	1
	CHOKWE	2	11	2,492	4	1	8
	GUIJA	3	6	12,560	3	3	6
	MABALANE	3	9	3,564	5	0	8
	MANDLACAZE	9	16	33,786	15	0	7*
	MASSANGENA	4	1	1,805	4	2	8
	MASSINGIR	7	6	9,677	12	3	11*
	XAI-XAI	0	8	-	-	-	-
	Total	**46**	**95**	**90,766**	**70**	**9**	**77**
INHAMBANE							
	FUNHALOURO	19	7	12,215	40	3	27
	GOVURO	2	11	2,379	2	0	7
	HOMOINE	13	19	14,083	17	2	87
	INHARRIME	10	15	19,969	13	1	61
	INHASSORO	8	2	14,571	15	0	19
	JANGAMO	17	9	35,838	32	0	109
	MABOTE	2	8	5,367	4	0	0*
	MASSINGA	10	8	85,108	13	2	8
	MAXIXE	1	0	93,985	3	2	2
	MORRUMBENE	13	13	18,912	19	0	3*
	PANDA	18	8	12,154	26	3	91
	VILANKULO	30	14	35,447	56	1	87*
	ZAVALA	14	11	23,005	21	0	51*
	Total	**157**	**125**	**373,033**	**261**	**14**	**552**

* Minimum Value: Certain communities could not report the precise number of victims

Province	District	Affected Villages	Unaffected Villages	Affected Population	Number of SMAs	Victims in Last 2 Years	Total Victims
MANICA							
	BARUE	4	7	7,178	10	0	3
	GONDOLA	18	8	27,641	43	7	51
	GURO	9	8	8,118	13	0	23
	MACHAZE	5	5	8,899	5	0	4*
	MACOSSA	3	7	2,550	4	0	5
	MANICA	8	5	8,642	14	5	14*
	MOSSURIZE	6	5	19,887	8	0	4
	SUSSUNDENGA	3	7	4,248	7	0	41
	TAMBARA	4	6	2,660	6	1	7
	Total	**60**	**58**	**89,823**	**110**	**13**	**152**
MAPUTO							
	BOANE	9	9	25,599	17	0	26*
	MAGUDE	16	15	15,605	33	4	30*
	MANHIÇA	17	18	31,734	32	1	28
	MARRACUENE	6	13	3,374	7	1	30
	MATUTUINE	23	18	15,220	48	4	138
	MOAMBA	16	11	17,343	27	2	94*
	NAMAACHA	13	13	17,717	20	1	25*
	Total	**100**	**97**	**126,592**	**184**	**13**	**371**
NAMPULA							
	ANGOCHE	1	5	725	2	0	1
	ILHA DE MOCAMBIQUE	1	0	42,407	2	-	0*
	LALAUA	1	7	600	1	0	0
	MALEMA	5	4	7,788	9	0	1
	MECONTA	6	3	6,252	10	2	16*
	MECUBURI	4	6	5,402	4	10	10
	MEMBA	3	6	5,797	3	0	16
	MOGINCUAL	10	4	9,276	17	0	3
	MOGOVOLAS	1	6	672	1	0	0
	MOMA	7	7	6,433	11	0	4
	MONAPO	8	3	12,218	15	0	27*
	MOSSURIL	2	2	18,215	5	0	0
	MUECATE	7	1	11,985	15	3	8*
	MURRUPULA	6	3	18,752	9	25	29
	NACALA-VELHA	3	1	2,083	4	0	4
	NACAROA	4	0	9,885	4	2	7
	NAMAPA-ERATI	4	7	11,479	4	3	5*
	NAMPULA	4	2	5,473	7	8	26
	RIBAUE	4	5	2,710	7	0	1
	Total	**81**	**72**	**178,152**	**130**	**53**	**158**

* Minimum Value: Certain communities could not report the precise number of victims

Province	District	Affected Villages	Unaffected Villages	Affected Population	Number of SMAs	Victims in Last 2 Years	Total Victims
NIASSA							
	CUAMBA	5	6	6,243	9	0	18
	LAGO	1	5	1,058	3	0	1
	LICHINGA	3	7	3,164	3	0	6
	MAJUNE	0	10	-	-	-	-
	MANDIMBA	3	5	9,125	4	0	3
	MARRUPA	2	10	1,802	7	0	1
	MAUA	3	7	3,543	5	2	2*
	MAVAGO	0	2	-	-	-	-
	MECANHELAS	7	5	12,600	12	1	13*
	MECULA	3	4	4,083	5	0	4*
	METARICA	3	2	1,347	4	0	1
	MUEMBE	1	3	2,007	1	0	7
	N-GAUMA	1	3	1,883	1	0	0
	NIPEPE	2	4	4,933	2	0	3
	SANGA	6	3	8,591	6	0	1
	Total	**40**	**76**	**60,379**	**62**	**3**	**60**
SOFALA							
	BUZI	6	9	9,039	7	0	12
	CAIA	7	0	23,791	13	2	9
	CHEMBA	3	3	1,717	4	0	5*
	CHERINGOMA	1	1	1,233	1	0	0
	CHIBABAVA	12	2	14,372	33	4	24*
	DONDO	3	0	31,830	11	2	172
	GORONGOSA	9	5	24,715	16	2	39
	MACHANGA	4	3	1,469	6	4	16
	MARINGUE	3	4	8,328	3	0	0
	MARROMEU	1	0	1,029	2	0	0
	MUANZA	1	2	249	4	0	3
	NHAMATANDA	2	3	16,384	2	0	7
	Total	**52**	**32**	**134,156**	**102**	**14**	**287**
TETE							
	ANGONIA	1	23	720	1	0	0
	CAHORA-BASSA	3	13	16,338	3	3	3*
	CHANGARA	11	17	15,716	21	1	11
	CHIFUNDE	2	14	1,355	4	0	0*
	CHIUTA	10	10	13,314	16	4	9
	MACANGA	2	11	2,697	3	1	11
	MAGOE	5	6	9,890	8	2	14
	MARAVIA	2	19	1,046	2	0	0*
	MOATIZE	10	17	8,159	13	1	9
	MUTARARA	8	9	19,100	10	4	29*
	TSANGANO	1	14	1,284	3	0	0
	ZUMBO	3	8	3,977	5	0	0*
	Total	**58**	**161**	**93,596**	**89**	**16**	**86**

* Minimum Value: Certain communities could not report the precise number of victims

Province	District	Affected Villages	Unaffected Villages	Affected Population	Number of SMAs	Victims in Last 2 Years	Total Victims
ZAMBEZIA							
	ALTO MOLOCUE	6	14	9,927	11	0	1
	GILE	7	14	11,118	10	3	10*
	GURUE	11	9	19,784	23	4	17
	ILE	8	15	17,283	17	0	32
	LUGELA	14	3	12,938	31	1	48
	MAGANJA DA COSTA	8	18	13,639	13	0	15
	MILANGE	11	16	19,224	25	1	36
	MOCUBA	9	8	16,040	17	0	31*
	MOPEIA	7	5	10,112	9	10	40
	MORRUMBALA	9	27	15,930	13	3	29
	NAMACURRA	6	1	9,370	9	1	12
	NAMARROI	7	9	8,893	8	0	18
	NICODALA	3	13	2,885	4	0	7
	PEBANE	7	20	4,384	10	0	4
	Total	**113**	**172**	**171,527**	**200**	**23**	**300***
MOZAMBIQUE							
	Grand Total	**791**	**938**	**1,488,590**	**1,374**	**172**	**2,145***

* Minimum Value: Certain communities could not report the precise number of victims

Background & Methodology

Project Timeline

The following timeline identifies the major steps in the evolution of the MLIS.

- **October-November 1997** – *Program Design Mission* – Georges Focsaneanu, Landmine Consultant to the CIDA, traveled to Mozambique to evaluate the capacity of the National Demining Commission ("CND") to plan and coordinate mine-clearance activities, to identify one or more suitable projects for funding by the CIDA, and to prepare an outline plan for implementing and managing the recommended project(s). Based on discussions with numerous stakeholders, he recommended three projects, including the …*implementation of a Level 1 National General Survey using a Canadian commercial company…*
- **August 1998** – The Mozambique Ministry of Foreign Affairs and Cooperation and the Canadian High Commissioner for Mozambique executed a Memorandum of Understanding for support to mine-action in Mozambique. The projects contemplated included the Level 1 National General Impact Survey and technical assistance to prepare 1:50,000 maps and to update national toponymy.
- **September 1998** – The CIDA issued a public Request for Proposals.
- **October 1998** – Deadline for receipt of proposals.
- **January 1999** – Contract awarded to the CIDC in partnership with PFWAI.
- **February 1999** – David Horton, Executive Director, CIDC, Roger Gumbrill, Mine Action Supervisor**,** CIDC, and Brigitte Masella, Senior Research Associate, PFWAI, and Coordinator of Analysis Services, visited the SAC in Washington, D.C., to share ideas. They then spent three weeks in Mozambique on an Inception Mission to inform and consult the CND, other Mozambican agencies, NGOs and commercial demining organizations, and to collect the other information needed to formulate a Project Implementation Plan ("PIP"). The senior local personnel were recruited. The collection of expert opinion was initiated.
- **April 1999 –** The PIP was submitted to the CIDA in English and to the CND in Portuguese. Vehicles and major items of equipment were ordered. David Horton and Brigitte Masella met representatives of the SAC and other organizations in Washington, D.C., for preliminary discussions about the evolving IMSMA database, certification standards, and other matters.
- **April–September 1999** – The research instruments and protocols were drafted and translated into Portuguese. Training materials for the survey personnel were prepared. Candidates for training as survey personnel were recruited on the basis of national

advertisements, an aptitude test, and interviews. The first revision of the PIP was tabled.

- **May 1999 –** The CIDC opened its administration office in Maputo and recruited additional local administrative staff. David Horton presented an overview of the current status and projected evolution of the MLIS to a mine-action seminar hosted by the IDRC in Maputo. The CND informed the CIDC of a significant delay relating to approvals for the duty-free importation of vehicles and equipment.
- **June 1999** – The Government of Mozambique created the IND to assume responsibility for and coordination of mine-action under a new mandate and Director. The activities of the CND were terminated.
- **August 1999** – Field checks revealed serious inadequacies in the accuracy of maps and toponyms. The IND reported that the problems surrounding the importation of vehicles and equipment had been solved.
- **September 1999** – The revised PIP, which addressed organizational rather than structural changes to the MLIS, was submitted. The delivery of vehicles and major equipment started. The Geneva International Centre for Humanitarian Demining provided IMSMA database and GIS training for two members of the IND's staff at the first centralized IMSMA training course. IMSMA trainers from the Center for Security Studies and Conflict Research of the Swiss Federal Institute of Technology Zürich executed the training and provided remote support thereafter, as required.
- **October-November 1999** – The CIDC held a seminar for the IND to report on progress and present survey plans. The QAM paid his first visit. Classroom training, which included the pre-testing of the research instruments by means of interviews with community members, was given to prospective survey personnel in a residential setting at a training camp operated by the ADP at Moamba, Maputo Province. The research instruments were modified in the light of the results of the pre-testing.
- **November 1999** - Field-testing of the research instruments, equipment, and logistical arrangements, which was also the final segment of the training program for the prospective survey personnel, was conducted in some 20 communities in Matutuíne District, Maputo Province. Discussions were initiated with the INE on compiling a national toponymic database.
- **December 1999** – A representative of the ADP compared the data on the location of SMAs collected in group interviews during the field-testing with that already in the possession of the ADP and found a high degree of correspondence. CIDC personnel participated in the *Yemen/Mozambique Survey Coordination Meeting* in Geneva, where they discussed lessons learned with representatives of the SAC, the MCPA (which was executing a LIS in Yemen), the GICHD, and the UNMAS.
- **January 2000** – The research instruments and protocols were modified in the light of the field-testing. Selected survey personnel were assigned to compiling and digitizing the toponymic data of the INE.

- **February 2000** – One week of refresher training was given to the survey personnel. Ian Hatton, Analytical Coordinator, traveled to Zürich for training on the IMSMA database.
- **March 2000** – The second revision of the PIP was tabled. The survey personnel were deployed to the field. Flooding in central and southern Mozambique imposed a major modification to the survey plan: instead of working from south to north, the MLIS was forced to begin in Nampula Province, moving north from there to Cabo Delgado and Niassa Provinces, and then gradually south. As a consequence, survey activities had to be initiated in some provinces before the collection and analysis of expert opinion were complete. An additional staff member was recruited to collect expert opinion at the District level. Recruitment and training of the data-entry staff began.
- **May-July 2000** – The CIDA provided IMSMA database training in Maputo for members of the IND's staff. The curriculum focused on summary database reports and associated mapping, and was designed to improve the IND's capacity to manage information on technical survey and landmine clearance activities.
- **June 2000** – The final PIP was tabled. The data-entry and analysis staff were moved to office space provided by the IND. Work focused on producing base maps for group interviews, entering data from expert opinion collection into a database, and producing Verification Sheets permitting the survey teams to compare the results of group interviews with the data from expert opinion collection.
- **July 2000** – Compilation of toponymic data for the purposes of the MLIS was substantially completed, and the data were entered into the IMSMA database.
- **August-December 2000** – Entering data from the group interviews into the IMSMA database began. Group interviews and the collection and analysis of expert opinion at the District level continued.
- **November 2000-February 2001** – The CIDA provided further IMSMA database training for members of the IND's staff in Maputo.
- **January-May 2001** – Interim reports for all 10 provinces were submitted to the IND and the CIDA for comments and suggestions. The partially populated IMSMA database was transferred to the IND on an interim basis to facilitate the process of familiarizing the IND's personnel with it.
- **May 2001** – Group interviews were completed, and field personnel were demobilized. The entering of data into the IMSMA database was completed shortly thereafter. Preparation of the National Report began. The complete version of the populated IMSMA database was transferred to the IND to permit further testing prior to the departure of the CIDC's international personnel. The handover of vehicles, equipment and supplies to the IND was initiated. The QAM began his final visit.
- **June 2001** – The IND hired three of the CIDC's data-entry personnel. The highlights of the draft National Report were tabled with the IND for comment. The official transfer of the populated IMSMA database was made. The CIDC's data-entry office at the IND

was closed. The handover of vehicles, equipment and supplies to the IND was completed. Most of the CIDC's international staff and the QAM left Mozambique.

- **July 2001** – The final member of the CIDC's international staff left Mozambique.
- **August 2001** – The National Report was completed and submitted to the IND, the CIDA, and the QAM.
- **September 2001** – The MLIS was certified by the United Nations Certification Committee.

Key Participants

The MLIS succeeded only thanks to the collaboration of numerous national and international organizations.

- **Canadian International Demining Corps**, formerly the Canadian International Demining Centre, is a Canadian non-governmental organization engaged in humanitarian mine-action in Africa, Asia, Eastern Europe, Latin America and the Middle East. In cooperation with government agencies, national mine-action centers, the United Nations, NATO, other NGOs and demining organizations, the CIDC is working to integrate counter-mine measures with sustainable development and community reconstruction initiatives in areas suffering the aftermath of war. Services include: mined-area surveys, marking and clearance; canine mine detection operations; training programs; technical consultations; and demining equipment procurement and testing programs.

- **Paul F. Wilkinson & Associates Inc.** is a Montréal-based consultancy in the environmental and social sciences. It specializes in projects involving indigenous peoples. Over the last 25 years it has worked in virtually every region of Canada, as well as in the Democratic Republic of the Congo, the Republic of Seychelles, the Federative Republic of Brazil, the Republic of the Philippines, and in several parts of the Republic of India, where it maintains an office in New Delhi.

- **Canadian International Development Agency** is the lead government organization for Canada's official development assistance. Its mandate is to support sustainable development in developing countries with a view to reducing poverty and contributing to a more secure, equitable and prosperous world. The CIDA entered into a bilateral agreement with the Government of Mozambique to support the national Landmine Impact Survey, and awarded the competitive contract to the Canadian International

Demining Centre ("CIDC"). Denise Conway, Project Team Leader for Mine Action in Mozambique, managed the MLIS on behalf of the CIDA. In-country project monitoring was provided by Alberto Silva of the CIDA-Project Support Unit. In addition, the CIDA provided the services of an internationally recognized mine-action consultant to regularly monitor the survey.

- **National Demining Institute ("IND")** Formerly the National Demining Commission, the IND was created by Decree No. 37/99 of the Council of Ministers in June 1999. It is the senior Mozambican government agency responsible for coordinating demining and for acting as the lead national agency for mine-action. It operates as a semi-autonomous institute within the Ministry of Foreign Affairs and Cooperation. The IND is governed by three councils: the Management Council; the Technical Council; and the Council of Cooperating Partners. The operation of the IND is overseen by a Director, assisted by a Deputy Director and six Department Heads. The IND is the custodian of all the hard-copy and electronic data gathered during the MLIS and is responsible for incorporating those data into a national mine-action plan.

- **Government Departments and Agencies** Under the coordination of the IND, a range of departments and agencies of the Government of Mozambique assisted the survey in such ways as by providing information and logistical assistance. They included: the Polícia da República de Moçambique; Rádio Moçambique; Forças Armadas de Moçambique; the Ministério para Coordenação de Acção ambiental; the Ministério da Agricultura e Pescas; the Ministério dos Recursos Minerais e Energia; the Ministério da Saúde; the Ministério do Plano e Finanças; the Ministério da Educação e Cultura; the Ministério de Indústria, Comércio e Turismo; the District Administrations in all 127 Districts visited; and several parastatal organizations.

- **National Institute of Statistics ("INE")** Reporting to the Minister of Finance and the Prime Minister, the INE is the central government agency responsible for collecting, analyzing, and publishing national statistics, designing and implementing national and sectorial studies, and conducting national censuses.

- **The Survey Action Center ("SAC")** is a Washington, D.C., based NGO that, on behalf of the 10 organizations making up the SWG, works globally to advance the cause of National Landmine Impact Surveys. The SAC provided full access for the CIDC to its operational protocols, lessons learned from other impact surveys, and advice on specific technical subjects as requested. In addition, the SAC provided the QAM to the MLIS during the first year of its operations.

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

Photograph 1: CIDA Representatives and QAM at Base Camp

Administrative Structures

Local Partnerships: The MLIS was conceived by the CIDA in consultation with the CND, the UNMAS and the SAC. It was organized under the independent management of the CIDC pursuant to a contract with the CIDA. The ministries of Defence, Health, Education, Environment, Agriculture, Industry Commerce and Tourism, Planning and Finance, Mineral Resources and Energy, the National Institute of Statistics, and the Armed Defence Forces of Mozambique and the Police were among the institutions that assisted with the execution of the MLIS. Provincial Governors in every province assisted with the collection of expert opinion and, where requested, arranged for radio and television broadcasts informing citizens about the MLIS. Expert opinion and/or databases were provided by the ADP, HALO Trust, NPA, Handicap International, MECHEM, Mine-Tech, Special Clearance Services and POWER Mozambique. Insights into previous national survey work in Mozambique and assistance with the recruitment of staff were provided by Arquivos do Património e da Cultura and faculty at the University of Mozambique. Other valuable forms of assistance were provided by, among others, DINAGECA and CENACARTA, and by the Maputo offices of the UNDP, the UNOPS, the UNICEF and the USAID.

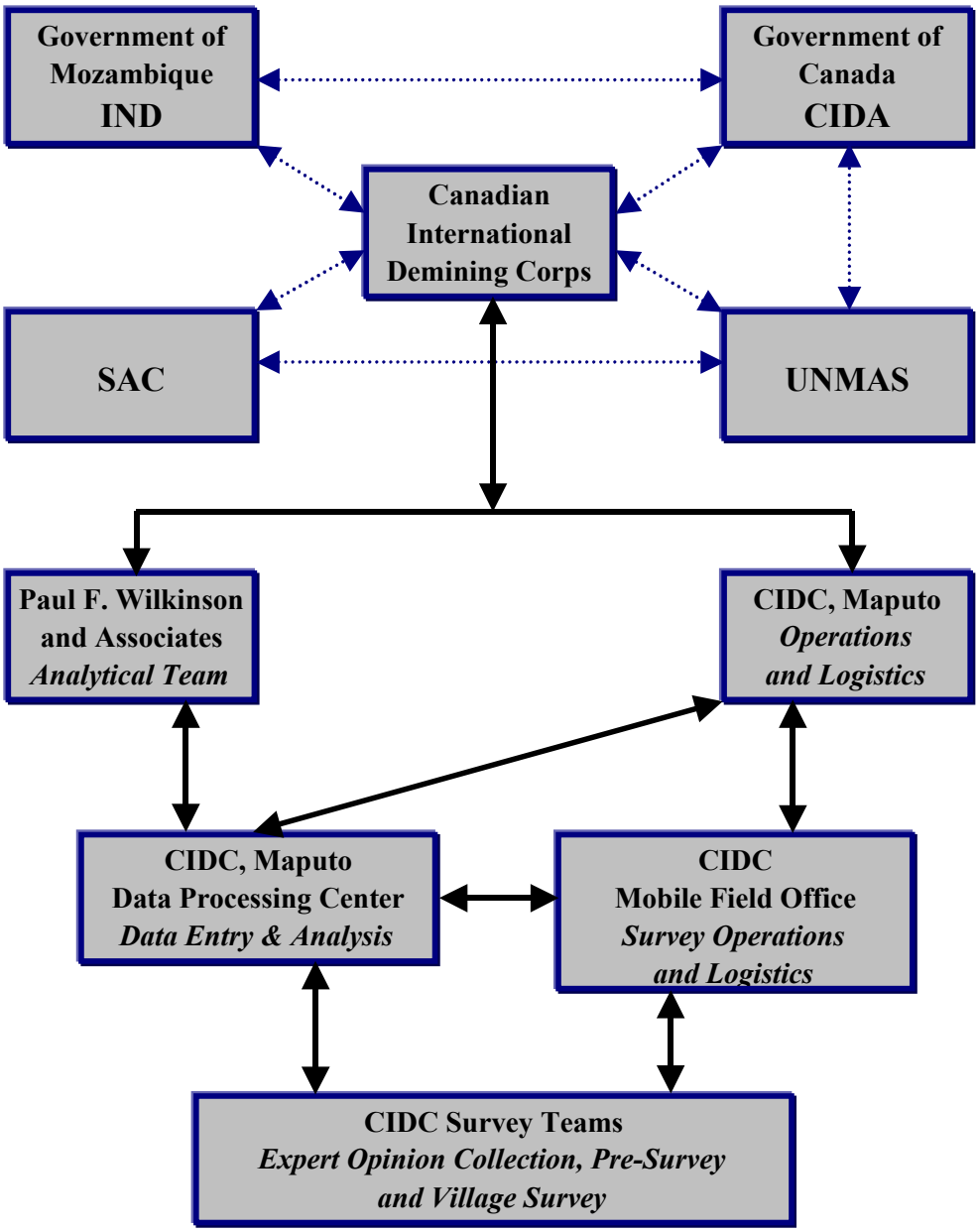
Survey Offices: The fact that the problem of landmines in Mozambique is so widely dispersed dictated that fieldwork be managed from a mobile base camp that moved into every region of the country. Consequently, no permanent regional offices were established. Base camp locations were Nampula City, Pemba, Lichinga, Gurue, Quelimane, Chimoio and Cumbana. Operations in the most southern regions were managed from the CIDC's Headquarters in Maputo. All data-entry, processing and analysis were performed at the CIDC's analytical office within the IND. Program administration and logistics support were provided from the Maputo Headquarters. Technical and analytical oversight was maintained at the Montréal offices of PFWAI, and general management of the program and liaison with the CIDA and the UNMAS were provided by the CIDC Head Office in Nova Scotia.

Project Staff: The management team comprised: David Horton, Executive Director of the CIDC, based in Nova Scotia; Michael Wilson, Program Director, based in Maputo; and Paul Wilkinson, principal of PFWAI, based in Montréal. Other senior positions included: National Survey Director, Field Survey Coordinator, GIS Supervisor, and Coordinator of Analytical Services. Two-person survey teams collected data, and they were supported by Supervisors, Interpreters, Drivers, and a range of camp and logistical support staff. Data processing and analysis were performed by a staff of six under the direction of the Coordinator of Analytical Services. Throughout most of the program, the MLIS employed approximately 60 Mozambican nationals on a full-time basis.

Technical Support: In addition to the technical services provided by PFWAI, the MLIS also received technical support on a consultative basis from the SAC.

Quality Assurance Monitor: Independent Quality Assurance services were provided by a part-time QAM for the UNMAS. Aside from a short period at the beginning of the program, when Joe Donahue, Operations Officer of the SAC, acted as the interim QAM, the position was filled by Michel Cipiere. The QAM operated in accordance with the terms of the UNMAS Impact Survey Certification Guidelines. In total, the QAMs spent over five months in Mozambique, during seven visits, at key phases of the MLIS, from initial training through to the near-completion of the drafting of the National Report. Additional monitoring services were performed by Georges Focsaneanu, a mine-action consultant to the CIDA, and the staff of the IND also monitored the project on a periodic basis.

Figure 14 IMPLEMENTATION STRUCTURE



Finances

BUDGET AND EXPENDITURES

Initial cost estimates were developed by the CIDA following the Program Design Mission of October-November 1997. These estimates formed the basis for a preliminary budget that was subsequently amended, initially on award of the contract to the CIDC, and ultimately based on actual costs.

The development of methodologies and research instruments and protocols was undertaken by the CIDC in consultation with the UNMAS and the SAC, which absorbed their own costs. With the exception of monitoring expenses, all costs associated with the MLIS, including project development, provision of technical support, training, project management, coordination and implementation, were borne entirely by the Survey. The cost of the MLIS may be summarized as follows:

	Canadian Dollars	U.S. Dollar Equivalent
CIDC (survey and technical support)	$ 2,645,000	$ 1,707,000
Vehicles & equipment	755,000	487,000
	$ 3,400,000	$ 2,194,000

All the vehicles and most of the functional equipment remaining at the conclusion of the MLIS were donated by the CIDA to the IND.

The costs of monitoring incurred by the UNMAS, the SAC, and the CIDA were met by each of those organizations.

FUNDING MECHANISMS

All the funding for the MLIS was provided by the CIDA.

Mozambique Methodology

It is important that LISs conducted in different countries employ similar methodologies if they are to achieve the long-term objective of the GLS of collecting comparable types of data about impacts that are of uniform quality for landmine-affected countries. At the same time, the methods used in each LIS must be adapted to the unique conditions prevailing in the country where it is conducted.

The basic components of the standard methodology are: (i) collecting and analyzing expert opinion to identify communities that are likely to be affected by landmines or UXO; (ii) visiting each of the communities so identified, and conducting group interviews in those that self-identify as landmine-affected; (iii) visiting a sample of the communities not identified by expert opinion as landmine-affected, and conducting group interviews in those found to be landmine-affected; (iv) entering the data collected into a database; and (v) conducting preliminary analysis thereof.

The MLIS followed the standard methodology explained in the *Global Landmine Survey* report, with only essential modifications dictated by the following:

- The large size of Mozambique (799,380 km²) and the absence of a functional road network in much of it;
- Extensive flooding in the central and southern parts of the country in early 2000 and somewhat less severe flooding in early 2001;
- The apparently widespread distribution of landmine-affected communities, which required the CIDC to plan from the outset on the assumption that survey teams would have to visit virtually every part of the country;
- The absence of a comprehensive and accurate national gazetteer or equivalent;
- The lack of accurate maps of an appropriate scale for group interviews;
- The impossibility of applying in its entirety the false-negative sampling protocol of the SAC (versions of 23 April 1999 and 3 January 2000); and
- The nature, availability, and quality of expert opinion.

TOPONYMY DATABASE

A national gazetteer that, at a minimum, lists the official name of each community and gives its unique identification number and its geographic coordinates is a prerequisite for an effective LIS. Without a national gazetteer, understanding data from third parties, reconciling information from different sources, planning and executing group interviews, entering data into the IMSMA database, and sharing information unambiguously with other parties are always difficult and often impossible. For example, the CIDC was ultimately able to match only 2,832/6,378 records from databases and expert sources with the official names in the toponymy database.

When planning for the MLIS began, a complete and current national gazetteer did not exist. With the assistance of the INE, the CIDC and the USAID compiled a national gazetteer, based on the results of the 1997 national census, in the form of a toponymy database.

The final version of the toponymy database contains for each of some 11,300 communities: official and alternate names; a unique numeric identification code; geographic coordinates; total population, broken down by sex and number of families; and administrative attribution (Province, District, Administrative Post, and Locality).

BASE MAPS

Obtaining reliable spatial data from group interviews requires accurate maps, ideally at a scale of 1:50,000, on which SMAs and other information can be recorded. No single series of pre-existing maps contained all of the information required for the MLIS. The CIDC was obliged therefore to create its own national cartographic coverage by electronically integrating data from a range of sources. The CIDC also devised a computer program that printed out for each village to be visited a 36" by 24", 1:50,000 base map with that village at its center. Because of the inadequacy of the pre-existing datasets, those base maps often lacked essential features and information, such as roads and rivers, while field-testing revealed that much of the information shown on them, such as the names and locations of communities, was inaccurate. A considerable portion of each group interview had therefore to be devoted to verifying and completing the base maps.

EXPERT OPINION AND SITE SELECTION

Expert opinion collection included the compilation of hard-copy and electronic data held by mine-action and other relevant organizations and interviews with knowledgeable persons in order to prepare preliminary lists of landmine-affected and landmine-free communities to guide

the planning of fieldwork. Interviews were conducted in conformity with a protocol, using an interview guide in which responses were entered.

Between February and September 1999, information was collected from 39 national-level sources. Many useful data were collected, but it also became apparent that more interviews than originally anticipated would have to be conducted at the Provincial and District levels. Between March 2000 and February 2001, 202 interviews were conducted in every Province. The Governor of each Province was interviewed, at which time his permission to conduct the LIS was solicited. The majority of the interviews were with District Administrations (45.3%), the national police force (30.9%), and NGOs (18.4%), while the remainder involved miscellaneous individuals and organizations, including parastatals. The average duration of the interviews was approximately 58 minutes, and the range was from 15 to 120 minutes.

The following major databases were examined: HI's *Programa para Prevenção a Acidentes contra Minas* ("PEPAM"); the DITERS database maintained by the IND before it adopted the IMSMA database; the HALO Trust's database; the ADP's database; and the NPA's database. Data were also obtained from several commercial demining companies.

A *Verification Sheet* was prepared for each reported mined area, listing its location, the names of nearby villages, and other information.

The original implementation plan called for the MLIS to begin in southern Mozambique and to work generally northwards. That plan had to be abandoned at very short notice because of the widespread flooding that struck vast areas in central and southern Mozambique in February 2000. This unforeseeable circumstance necessitated a rapid remobilization of the survey teams and equipment to begin field operations in Nampula Province in March 2000.

Given the expectation, based on the prior work of numerous organizations, that landmine-affected communities would be found in every Province, the CIDC had planned since the Inception Mission in February 1999 on the basis that it would have to send survey teams to virtually every region of each of the 10 Provinces. The CIDC had also determined for planning purposes that it would have the capacity to visit approximately 1,800 villages nationally. Given the widespread distribution of landmine-affected communities, the CIDC decided to plan on the basis of visiting an average of approximately 180 villages per Province. A sample of 177 villages was, therefore, originally selected for Nampula Province.

The villages to be visited in Nampula Province were selected on the basis of the CIDC's preliminary appreciation of the relevant expert opinion with which its senior personnel was already familiar and their personal knowledge derived from their lengthy involvement in mine-action in Mozambique. The first step was to select for visits any village that had been identified

as landmine-affected by an official source. An additional category of villages was selected for visits on the basis of their proximity to reported mined areas. The foregoing villages were considered at the time to correspond broadly to the category *Probably Landmine-Affected* ("PA") identified in *Protocol Document #11* of the SAC. The remaining villages to be visited, which were considered to correspond to the category *Probably Landmine-Free* ("PF"), were selected on a geographically stratified basis designed to ensure broad geographic coverage of all unsampled areas in the Province, while respecting the total number of communities per Province that it was possible to visit.

Because of the delay before the collection and analysis of expert opinion could catch up with the fieldwork, sampling in Cabo Delgado and Niassa provinces was done in the same way as for Nampula Province.

Sampling in Zambézia and Tete Provinces proceeded as follows:

All villages named as landmine-affected in an official source were selected to be visited. If, however, no village was linked by name to a reported mined area, the following procedure was applied to determine which additional villages considered as PA would be visited:

- If a reported mined area was within the built limits of a village, which, however, was not specifically named as landmine-affected in an official source, only that village was selected;
- If there was only one village within a 4-km radius of a reported mined area outside the built limits of a village, that village was selected;
- If there were several villages within the 4-km radius, and if there were other reported mined areas within 4 km, the village falling within 4 km of the most reported mined areas was selected;
- If there were several villages within the 4-km radius, but no other reported mined areas, the village closest to the reported mined area was selected.

The balance of the sample, corresponding to the PF category, was selected in the same way as for Niassa and Cabo Delgado Provinces.

In each of the remaining Provinces, the sample of PA villages was selected in the same manner as in Zambézia and Tete Provinces. The sample of PF villages was, however, selected according to the Protocol of the SAC, save that the sampling unit was defined as a cluster of three or four Districts in order to keep the number of PF villages to be visited to a manageable size. Whenever a PF village self-identified as landmine-affected, thus becoming a false-negative village, a group interview was conducted, and the nearby area, defined by a 4-km radius from the false-negative village, was searched for other landmine-affected communities.

GROUP INTERVIEWS

Group Interviews employed the *Village Survey Questionnaire* ("VSQ"), which can usefully be divided into six modules, each of which can be subdivided into several segments, as follows:

Community-Level Module – Part 1

Segment 1: Village Identification, including GPS coordinates of a reference point
Segment 2: Certification by a Local Leader
Segment 3: Identification of Participants
Segment 4: Historical Context
Segment 5: Mapping of SMAs
Segment 6: Socio-Economic Impacts
Segment 7: Total Victim Numbers

Suspected Mined Area Module (one for each SMA)

Segment 8: Number, Name, and Size
Segment 9: Marking, Terrain, Suspected Ordnance, and Classification
Segment 10: Recent Victims
Segment 11: Proximity Verification from a Safe Point

Individual Victim Module (one for each recent victim)

Segment 12: Victim Descriptors
Segment 13: Activity at Time of Accident
Segment 14: Consequences of Accident

Community-Level Module – Part 2

Segment 15: Additional Information
Segment 16: Interview Closure
Segment 17: Dates, Duration, Language, Chairing
Segment 18: Non-Conduct/Premature Termination
Segment 19: Supervisor's Certification

Behavioral Impact Module (one per Interviewee)

Segment 20: Concern and Behavior

Village Infrastructure Module

Segment 21: Access
Segment 22: Infrastructure/Services

On the way to each community, the survey team recorded in Segment 21 the route that they followed, taking GPS readings at regular intervals, in order to assist others to make their way to it in the future. If the community proved to be inaccessible, the reason was noted in Segment 18.

Upon arrival in a community, the team members introduced themselves to the *Regulo* or other figure of authority and explained the purpose of their visit. If that person stated that the village was not landmine-affected, the team sought confirmation from five independent sources, recording basic personal information about them in Segment 18. If all five sources confirmed that landmines were not affecting the community, Segment 2 was completed, and the team left.

If, however, the *Regulo* or any one of the five additional sources stated that the community was landmine-affected, permission was sought to conduct a group interview. If permission was refused, which was very rare, Segments 18 and 2 were completed, and the team left the community.

The large distances involved made it virtually impossible for the survey teams to return to a community, and the majority of group interviews were therefore held within approximately two hours of the arrival of the survey team in the community. That may have had some effects on the representativity of the Interviewees, but it effectively precluded any possibility of collusion among them. The survey team used the period before the start of the group interview to collect information about the infrastructure and services available in the community, which was entered into Segment 22.

Photograph 2: Preparation for Group Interview

If permission to conduct a group interview was granted, a group of between 5 and 14 Interviewees was formed. An effort was made to ensure that men and women were represented in roughly equal numbers, and that the group was broadly representative of the composition of the community's population with respect to age and occupations. As the Interviewees arrived, they were asked to provide basic personal information, which was entered in Segment 3.

Where group interviews had to be conducted in a language that the Interviewer did not speak fluently, the services of an interpreter, usually one who had been trained in advance in the vocabulary of the VSQ, were used, and the quality of his/her performance was recorded in Segment 17.

The Interviewer posed the questions in the VSQ in numerical order and entered the responses in the VSQ, while the Recorder took detailed notes.

The base map formed the focal point of the group interview. The map was mounted on an easel with the north at the top, and the Interviewees sat facing it to the south, so that north on the map was straight in front of them. The Interviewer checked the familiarity of the Interviewees with the surrounding area and the accuracy of the base map by asking them to confirm the names of villages, rivers, and other features, and to estimate the associated distances. In many cases,

the Interviewees were able to correct the information shown on the base maps and to add names and features.

Photograph 3: Group Interview with Base Map

Once the base map had been corrected, it served as the primary tool for mapping the Suspected Mined Areas ("SMAs"), which were drawn on the base map by the Interviewer according to the instructions of the Interviewees. Every effort, particularly the use of group consensus, was made to ensure that each SMA was recorded in the right place and at the correct scale. Based on the information provided by the Interviewees, the Recorder simultaneously made a separate, more detailed sketch of each SMA, which was shown to the Interviewees for their approval.

Once the SMAs had been mapped, information on their socio-economic impacts (Segment 6), their characteristics (Segments 8 and 9), and victims (Segments 7, 10, 12, 13,14) was collected.

Towards the end of the group interview, the Interviewer and Recorder consulted the Verification Sheets to ascertain whether the collective mapping exercise had identified every nearby SMA listed in a database or reported in an interview. Where necessary, supplementary questioning attempted to resolve any discrepancies.

At the end of the group interview, the Interviewees were asked to remain behind for a few moments, so that they could complete the Behavioral Effects Sheet (Segment 20) on an individual basis.

Following the group interview, proximity verification was conducted with the assistance of local guides, where time permitted and it was safe to do so, and the information collected was entered at Segment 11.

Photograph 4: Proximity Verification

Before leaving the community, the Interviewer and the Recorder each checked the other's work for legibility, completeness, and apparent anomalies. If the survey team included a Supervisor, he also checked the VSQ in the village. An immediate attempt was made to correct any serious omissions or to clarify seeming anomalies. If the Supervisor met the survey team only later, he checked the completed VSQ as soon as possible.

Photograph 5: Proximity Verification

Before leaving the community, the survey team met the *Regulo* or his substitute again, answered any questions, thanked him, and asked him to certify the team's visit by signing Segment 2.

Upon their return to the base camp, the survey team or the Supervisor, as the case may be, gave the completed VSQ and all related documentation to the Field Survey Coordinator, who checked it at the earliest possible opportunity. If any shortcomings were observed, the Field Survey Coordinator attempted to resolve them in discussion with the Supervisor and the survey team responsible. The Field Survey Coordinator

forwarded the completed VSQs by the most secure means available to CIDC's Analytical Office in Maputo.

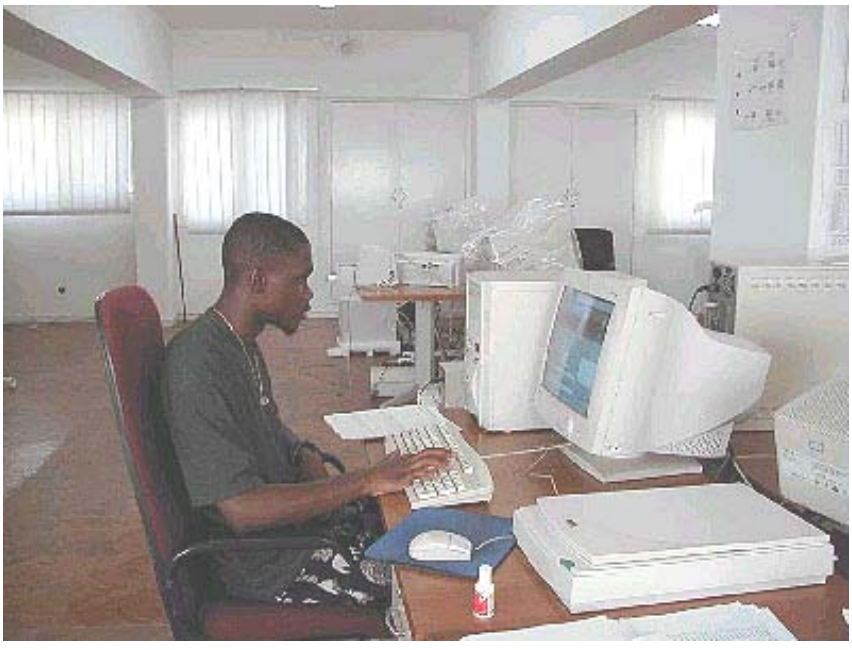
DATA-ENTRY AND ANALYSIS

Shortly after their arrival in Maputo, a sample of each batch of VSQs was checked for legibility, completeness, accuracy, and the internal consistency of answers. Recurring problems were communicated to the Field Survey Coordinator in writing, and, on a few occasions in the early stages of the MLIS, senior personnel traveled to the field to administer intensive refresher training.

The CIDC's survey instruments were devised while the IMSMA database was itself still at the developmental stage. Despite regular communications between the CIDC and the SAC, there were minor differences between the structure of the VSQ and that of the IMSMA database. In order to reduce the danger of errors during data-entry, the CIDC translated the IMSMA database into Portuguese and adapted it to increase its correspondence with the structure of the VSQ, without, however, compromising the maintenance of the standardized set of data fields found in the IMSMA Field Module in use by the IND. Moreover, the complete list of toponyms and geocoordinates populating the CIDC's Location tables in the IMSMA database were propagated to the IMSMA database in use by the IND and the ADP so that coordination could be initiated among mine-action centers. When the populated IMSMA database was transferred to the IND, the temporary modifications were removed.

Data-entry was conducted on a daily basis by between three and six Mozambican nationals trained and employed by the CIDC. For an experienced data-entry technician, entering a completed VSQ with one SMA took 50-60 minutes, and an additional 10-15 minutes were required for each additional SMA.

Photograph 6: Data-Entry



Basic data on communities that were visited and that declared that they were not landmine-affected were also entered into the IMSMA database, because of the importance to future mine-action operators of knowing the

landmine status of such communities. One of the particular challenges that the CIDC itself had faced was that it could rarely ascertain whether regions of Mozambique where no landmine-affected communities or SMAs were recorded had been surveyed and found to be uncontaminated, or whether they had not even been surveyed.

Immediately after the information from each VSQ and the related documentation had been entered into the IMSMA database, a junior supervisor checked every entry, and any necessary corrections were made. A data-entry technician other than the one who had originally entered the data then made a second check of every entered VSQ and produced a simple summary report of the findings. Senior supervisors checked a sample of the entered VSQs, paying particular attention to ensuring that the answers to the open-ended questions on impacts in the VSQ had been entered in a standardized way. The data for each Province were then synthesized and, using database searches and mapping, analyzed for "outliers" or apparent anomalies, which were examined on a case-by-case basis.

The answers to the open-ended questions concerning the impacts of SMAs were interpreted in conjunction with the notes and sketches prepared during the group interview in order to populate the blockage impact fields in the IMSMA. The original responses to the questions were inputted, and the sketches were scanned into the IMSMA database, affording supervisory personnel with a cross-checking capacity in a database environment.

Once the quality checks had been completed, an interim report for each Province was prepared and submitted to the CIDA and the IND for comment. At about the same time, the electronic data for that Province were transferred to the IND on a trial basis. Once data-entry for the entire country had been completed and re-checked, the definitive version of the populated IMSMA database and the hard copies of the VSQ and all associated documentation were transferred to the IND and tested to ensure that they were fully operational. Copies were made for safekeeping in Canada and Mozambique.

THE MINE IMPACT SCORE

A primary purpose of a LIS is to facilitate the prioritizing of human, material and financial resources by, among other things, giving national authorities an impact-based tool with which to develop national mine-action plans focusing on communities or regions suffering the greatest impacts. A mechanism is therefore required to rank communities on the basis of their impacts. Since LISs are to be conducted using a standardized methodology, a common approach must be used to rank communities on the basis of impacts. That objective implies the use of a generalized, weak-metric ranking instrument. The SWG endorsed such an instrument, known as the *Mine Impact Score*, developed by the SAC, which is to be used in every LIS. Its principal features are summarized below.

The value of the *Mine Impact Score* for a given community reflects three aspects of the mine situation as it affects that community:

- the types of munitions, landmines or UXO suspected to be present by the participants in the group interview;
- the categories of land, infrastructure, and service areas to which landmines or UXO are blocking access; and
- the numbers of victims of landmines or UXO in the two years preceding the group interview.

The *Mine Impact Score* is not designed to be sensitive to a range of factors, including the number and size of the SMAs affecting a given community, or the total number of victims of landmines.

More specifically, the following variables are considered in calculating the *Mine Impact Score* for a given community:

Group 1

- the presence of landmines;
- the presence of UXO;

Group 2

- whether access to rainfed or irrigated agricultural land is blocked;
- whether access to fixed or migratory pasture is blocked;
- whether access to non-agricultural land is blocked;
- whether access to water sources (for drinking or other uses) is blocked;
- whether access to housing areas is blocked;
- whether roads are blocked;
- whether access to other infrastructure or service areas is blocked;

Group 3

- the number of victims of landmines and UXO in the two years preceding the group interview.

For the variables in Groups 1 and 2, the scores are binary, meaning that a score of 1 is assigned if the impact in question was identified in a given community, while a score of 0 is assigned if that impact was not identified. Thus, a community that reports three SMAs, each of which is blocking access to agricultural land, will receive a score of 1 for that variable, as will a

community that reports only one SMA blocking access to agricultural land. The variable in Group 3, the number of victims in the two years preceding the group interview, in contrast, is a count variable, meaning that the actual number of victims during that period is entered as the score.

In order to calculate the Mine Impact Score, the score for each recognized category of impact is multiplied by a weight. Each national LIS is permitted to vary the weights for the variables in Group 2 within certain limits, but the weights for the variables in Groups 1 and 3 are fixed. Thus, the presence of landmines must be weighted 2, the presence of UXO must be weighted 1, and recent victims must be weighted 2. The principal restrictions on weighting the variables within Group 2 are that weights must be 0, 1, 2, or 3, and that the total of all the weights must equal 10.

Table 21 shows the weights used in the present report, which were chosen on the basis of the CIDC's experience, discussions with knowledgeable persons, and a review of the relevant literature.

Table 21 WEIGHTS ASSIGNED TO MINE IMPACT SCORE VARIABLES

Variable	Weight
Group 1	
There were landmines	2[1]
There was UXO	1[2]
Group 2	
Access to some rainfed cropland was blocked	2
Access to some irrigated cropland was blocked	0
Access to some fixed pasture was blocked	2
Access to some migratory pasture was blocked	0
Access to some non-agricultural land was blocked	1[3]
Access to drinking water was blocked	2
Access to water for other uses was blocked	1[4]
Access to a housing area was blocked	0
One or more roads were blocked	1[5]
Access to some other infrastructure was blocked	1[6]
Group 3	
There were landmine victims in the last 24 months	2[7]

[1] Value cannot be changed
[2] Value cannot be changed
[3] Includes areas for fuel, hunting, collecting fruit and edible and medicinal plants and building materials
[4] Includes water for irrigation, fishing, watering animals, bathing, laundry, and other purposes
[5] Includes local pathways, roads to District centre, roads to Provincial centre, and roads to National capital
[6] Includes bridges, dams or canals, railways, power lines, generating stations, factories, oil fields, medical facilities, educational facilities, markets, cultural sites, and other vital points
[7] Value cannot be changed

The Mine Impact Score is calculated automatically by the IMSMA.

For the purposes of the GLS, communities are assigned to one of four impact categories, as follows:

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

Attachments & Supporting Documentation

Supporting Analysis

MINE IMPACT SCORE SENSITIVITY

The weights originally used to calculate the Mine Impact Score (Table 22, Scenario 1) assigned 607/791 (76.7%) of landmine-affected communities to the low-impact category. The IND pointed out that, for purposes of long-term planning, it would be useful to have a system of ranking landmine-affected communities that did not assign so great a number of communities to a single category.

Table 22 presents the results of seven alternative weightings of the variables in the Mine Impact Score. Three of those scenarios result in an increase in the number of communities assigned to the high-impact category, but the increase is significant in only one case (Scenario 6). Six of the scenarios yield an increase in the number of medium-impact communities, ranging from 43 (Scenario 4) to 108 (Scenario 8).

The relatively modest increase in the number of high-impact communities is not surprising. The Mine Impact Score is dominated by the number of recent victims, the weighting for which, like that for the presence of landmines and UXO, is not permitted to be altered. In the absence of recent victims, it is virtually impossible for a community to attain the high-impact category no matter how the weightings of the blockage impacts are varied.

Significantly altering the number of communities in each impact category can self-evidently be achieved only through adjusting the weights assigned to blockage impacts that affect a large number of communities. In the case of the MLIS, the most numerous blockage impact were on rainfed cropland (464 communities), roads (231 communities), and non-agricultural land (180 communities). As is to be expected, the increases in high- and medium-impact communities reflect primarily adjustments to the weightings of those three variables.

In every case, however, the percentage of low-impact communities is very high (62.5% to 84.9%). Thus, the Mine Impact Score cannot entirely satisfy the need expressed by the IND. Nevertheless, by adjusting the weights to the extent permitted and in a manner that corresponds with the realities of Mozambique, the IND should be able to enhance the value of the MLIS for purposes of planning.

Table 22 MINE IMPACT SCORE ALTERNATIVE WEIGHTINGS

Scenario	1	2	3	4	5	6	7	8
Variable	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Types of Ordnance								
Landmines	2*	2*	2*	2*	2*	2*	2*	2*
Unexploded Ordnance (UXO)	1*	1*	1*	1*	1*	1*	1*	1*
Blockage Impacts								
Rainfed cropland	2	2	3	2	1	3	3	3
Irrigated cropland	0	0	0	0	0	0	0	0
Fixed pasture	2	1	1	1	2	1	1	1
Migratory pasture	0	0	0	0	0	0	0	0
Non-agricultural land	1	2	1	3	1	3	2	2
Drinking water	2	3	2	2	3	1	0	0
Other water uses	1	0	0	0	0	2	0	1
Housing area was blocked	0	0	0	0	0	0	0	0
Roads	1	2	3	2	3	0	3	2
Other infrastructure/services	1	0	0	0	0	0	1	1
Victims								
Victims within last 24 months	2*	2*	2*	2*	2*	2*	2*	2*
High	20	20	20	24	15	37	19	25
Low	607	561	524	560	672	502	517	494
Medium	164	210	247	207	104	252	255	272
None	1182	1182	1182	1182	1182	1182	1182	1182
Grand Total	1973	1973	1973	1973	1973	1973	1973	1973

* Fixed weights - value cannot be changed

SUPPLEMENTARY RANKING SYSTEM

The Mine Impact Score gives considerable weight to recent victims of landmine accidents and assigns a very high proportion of landmine-affected communities in Mozambique to the low-impact category.

The CIDC developed three experimental indices that might be better adapted to the circumstances of Mozambique. Those indices were designed for three principal purposes: to address the IND's requirement for a tool to create priorities among the large number of communities that fall into the low-impact category under the Mine Impact Score; to illustrate how the data stored in the IMSMA database can be used to develop other ranking instruments; and to circumvent some of the self-imposed constraints in the Mine Impact Score.

The three indices are: the Mine Contamination Index ("MCI"); the Resource Base/Infrastructure Index ("RBII"); and the Victims Index ("VI").

The MCI derives from the assumption that there is a relationship between the size of SMAs and their proximity to communities and the severity of their impacts on those communities.

It is calculated as MCI = WgtCumSA × SumWgtDist, where WgtCumSA = the weight applied to the sum of the area of each SMA expressed in square meters, and SumWgtDist = the sum of the individual weights for the distance of each SMA from the reference point in the landmine-affected community.

The weights for the cumulative area of the SMAs are:

0 – 10,000m^2	= 0.1
10,001 – 100,000m^2	= 0.3
100,001 – 1,000,000m^2	= 0.5
>1,000,000m^2	= 0.7

The weights for the distance of the SMAs from the communities are:

<1,000m	= 0.9
1,000 – 4,000m	= 0.6
4,001 – 9,000m	= 0.3
>9,000m	= 0.1

Because the weights for the distance of each SMA from the community in question are summed, the number of SMAs affecting a community – which might also affect the severity of the impacts – is taken into account indirectly.

The RBII is designed as a measure of the number and type of impacts on resources, services, and infrastructure. Thus, it employs some of the same information as the Mine Impact Score. It also takes into account, however, the opinion of the Interviewees as to whether the severity of the impacts is decreasing, constant, or increasing, and the population of the affected community. Population is considered to be an important variable in planning certain types of impact-oriented mine-action, for the simple reason that removing an impact affecting a large number of persons would usually be thought of as achieving a greater good than removing one that affects a smaller number of persons and will under some circumstances be more cost-effective.

The RBII is calculated as (WgtCrop + WgtPast + WgtFor + WgtWatDr + WgtWatFd + WgtWatCho + WgtRd + WgtInf + WgtServ) + WgtSev + WgtPop, where:

- WgtCrop = 2 = the weight assigned to the existence of blocked cropland;
- WgtPast = 1 = the weight assigned to the existence of blocked pasture;
- WgtFor = 1 = the weight assigned to the existence of blocked non-agricultural land;

- WgtWatDr = 2 = the weight assigned to the existence of blocked access to a source of drinking water;
- WgtWatFd = 1 = the weight assigned to the existence of blocked access to a source of water for animals, irrigation, or fishing;
- WgtWatCh = 0 = the weight assigned to the existence of blocked access to a source of water for such purposes as cleaning and bathing;
- WgtRd = 2 = the weight assigned to the existence of a blocked road;
- WgtInf = 1 = the weight assigned to the existence of blocked access to infrastructure;
- WgtServ = 1 = the weight assigned to the existence of blocked access to service points.

It is to be noted that the preceding weights do not take into account the magnitude of the blockage impacts, such as the areas of inaccessible land or the number of inaccessible service points.

- WgtSev = the weight assigned to the trend in the severity of the blockage impacts as a whole by the Interviewees, as follows:

Increasing severity	= 1.25
Constant severity	= 1.00
Decreasing severity	= 0.75

- WgtPop = the weight assigned to the size of the population of the community in question, as follows:

0 – 374 persons	= 0.1
375 – 750 persons	= 0.3
751 – 1,500 persons	= 0.5
1,501 – 3,000 persons	= 0.7
>3,000 persons	= 0.9

Unlike the Mine Impact Score, the VI can consider both victims of landmine accidents in the two years preceding the group interview and the total number of such victims since the start of the Independence Struggle. It is calculated as VI = TotVict × WgtRecVict, where:

- TotVict = the total number of victims since the Start of the Independence Struggle;
- WgtRecVict = the total number of victims in the two years preceding the group interview in the community in question, which is set at 1.0. Unlike the Mine Impact Score, therefore, the number of recent victims does not influence the VI as calculated herein.

Each of the three indices was normalized using the following formula:

$(X_i – X_{Min})/(X_{Max} – X_{Min})$, where:

- X_i = the value to be normalized;
- X_{Min} = the minimum value in the dataset;
- X_{Max} = the maximum value in the dataset.

The normalized individual indices for each community were then summed to generate the Normalized Composite Index. If desired, the individual indices could be weighted at this stage, but that was not done.

Table 23 summarizes the results of the Normalized Composite Index by Province. A comprehensive analysis of the individual indices and comparisons with the results of the mine Impact Score are beyond the scope of the present report. It is clear, however, that the Normalized Composite Index can meet the requirement of the IND for an instrument that will facilitate the ranking of communities classified as low-impact under the Mine Impact Score.

Table 23 NORMALIZED COMPOSITE INDEX, BY PROVINCE

Province	Impact Category[1]	Number of Communities
CABO DELGADO	High	11 (13.1%)
	High/Medium	17 (20.2%)
	Medium	12 (14.3%)
	Medium/Low	16 (19.1%)
	Low	28 (33.3%)
Total		**84**
GAZA	High	5 (10.9%)
	High/Medium	13 (28.3%)
	Medium	8 (17.4%)
	Medium/Low	12 (26.1%)
	Low	8 (17.4%)
Total		**46**
INHAMBANE	High	40 (25.4%)
	High/Medium	32 (20.4%)
	Medium	33 (21.1%)
	Medium/Low	33 (21.1%)
	Low	19 (12.1%)
Total		**157**
MANICA	High	11 (18.3%)
	High/Medium	15 (25.0%)
	Medium	9 (15.0%)
	Medium/Low	14 (23.3%)
	Low	11 (18.3%)
Total		**60**
MAPUTO	High	21 (21.0%)
	High/Medium	14 (14.0%)
	Medium	15 (15.0%)
	Medium/Low	30 (30.0%)
	Low	20 (20.0%)
Total		**100**
NAMPULA	High	4 (4.9%)
	High/Medium	14 (17.3%)
	Medium	15 (18.5%)
	Medium/Low	21 (25.9%)
	Low	27 (33.3%)
Total		**81**
NIASSA	High	4 (10.0%)
	High/Medium	10 (25.0%)
	Medium	5 (12.5%)
	Medium/Low	9 (22.5%)
	Low	12 (30.0%)
Total		**40**
SOFALA	High	12 (23.1%)
	High/Medium	10 (19.2%)
	Medium	8 (15.4%)
	Medium/Low	10 (19.2%)
	Low	12 (23.1%)
Total		**52**
TETE	High	14 (24.1%)
	High/Medium	6 (10.3%)
	Medium	7 (12.1%)
	Medium/Low	14 (24.1%)
	Low	17 (29.3%)
Total		**58**
ZAMBEZIA	High	27 (23.9%)
	High/Medium	26 (23.0%)
	Medium	24 (21.2%)
	Medium/Low	19 (16.8%)
	Low	17 (15.0%)
Total		**113**
NATIONAL LEVEL	High	149 (18.8%)
	High/Medium	157 (19.9%)
	Medium	136 (17.2%)
	Medium/Low	178 (22.5%)
	Low	171 (21.6%)
Total		**791**

[1] Category	Value
High	>0.32
High/Medium	>0.2 - <0.32
Medium	>0.13 - <0.2
Medium/Low	>0.05 - <0.13
Low	>0 - <0.05

EXPERT OPINION

Figure 15 summarizes the results of expert opinion collection and its validation by means of group interviews.

Expert opinion overestimated the number of landmine-affected communities and underestimated the number of landmine-free communities.

Only 58.9% of the communities identified as PA either because they were named as such by a source of expert opinion or were situated within 4 km of a SMA proved upon validation by means of a group interview to be in fact landmine-affected. Indeed, classifying a community as PA on the basis of its proximity to a SMA was virtually as good a predictor of its actual landmine status as doing so because it was named by a source of expert opinion. Some 59.8% of the communities visited because they were said by a source of expert opinion to be landmine-affected proved to be landmine-affected, compared with 55.2% of those selected because of their proximity to a SMA.

The reliability of expert opinion as a predictor of the landmine status of a given community varied by area and by source, ranging from 25% of the PA communities identified by one source in Cabo Delgado Province to 100% of those identified by three different sources in Sofala, Niassa, and Zambézia provinces.

The explanation for the high level of disagreement between the results yielded by expert opinion and group interviews is not clear.

In the case of false positives, the possibility that the mined area that had originally justified the designation of the village as PA had subsequently been cleared cannot be eliminated, although it seems unlikely to us that it would explain such a large number of false positives.

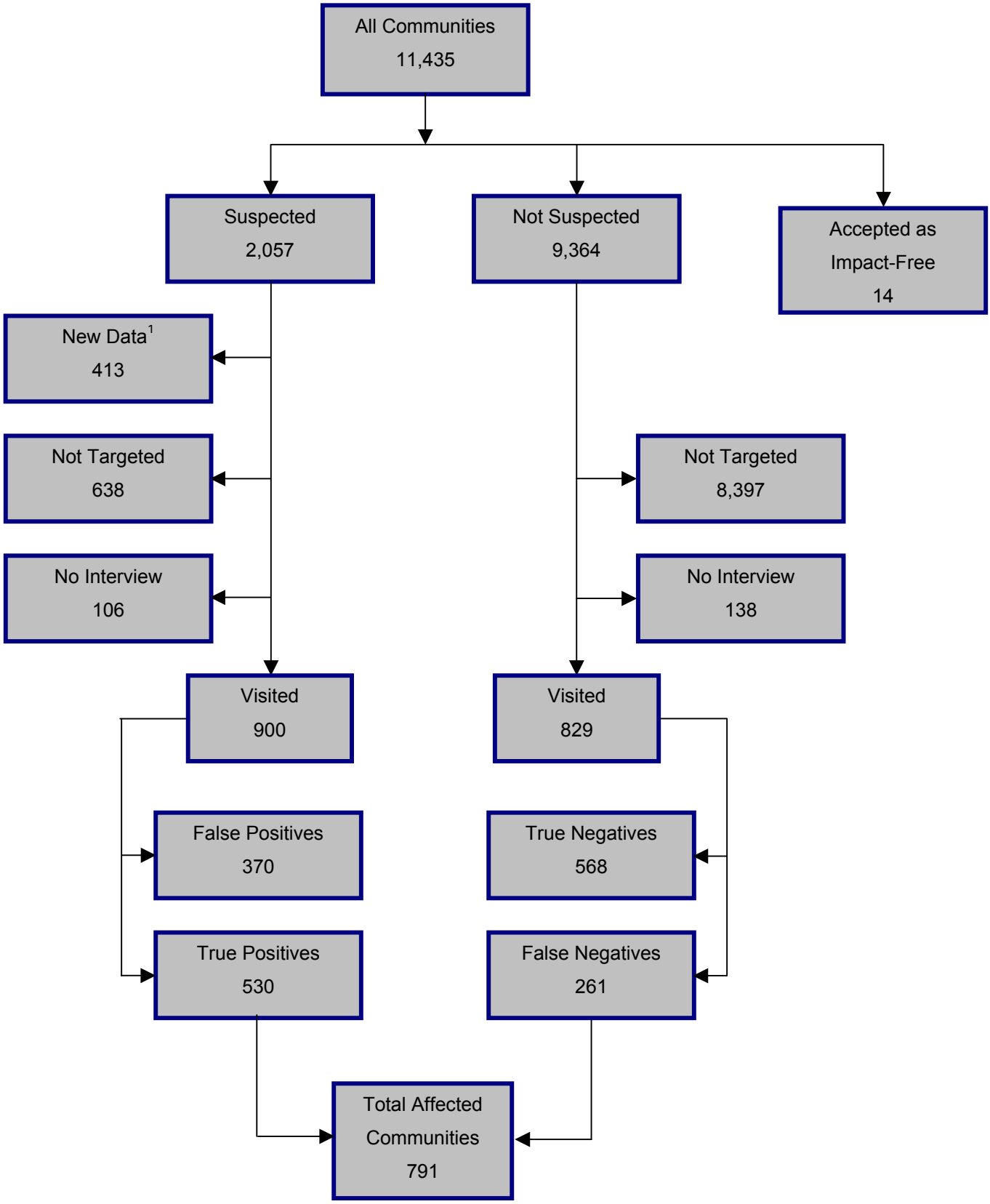
In the case of false negatives, there is always the possibility that mined areas that have been cleared are not accepted as such by the members of the concerned community. Once again, however, we find it hard to accept that that would account for such a large number of false negatives.

The large number of false-negative communities could also arise if the participants in group interviews deliberately provided incorrect information, possibly in the hope of attracting the employment and other economic benefits sometimes associated with demining. We reject that hypothesis, for several reasons:

- The delay between the arrival of a survey team in a community and the start of the group interview was usually too short to permit collusion among the Interviewees;
- The teams conducting the group interviews were trained to seek consensus among the Interviewees and to collect descriptive data about SMAs that would have been virtually impossible to fabricate;
- Proximity verification did not reveal a single instance in which a SMA was manifestly not mined, such as traces of recent use or occupation; and
- Deliberate deception by the Interviewees would not explain why the percentage of false positives (41.1%) was similar to that of false negatives (31.5%).

On balance, we incline to the view that expert opinion in Mozambique is inherently unreliable, perhaps because of the large size of the country and the poor transportation and communication infrastructure. The only way to collect reliable information is, therefore, to visit the communities themselves, but - as the MLIS documented – that poses formidable challenges of time, costs, and logistics.

Figure 15 RESULTS OF EXPERT OPINION COLLECTION



[1] : Data that became available after the group interviews in a given province had been completed, in some cases because refinements to the toponymy database permitted new matches with data from expert opinion collection

INACCESSIBILITY

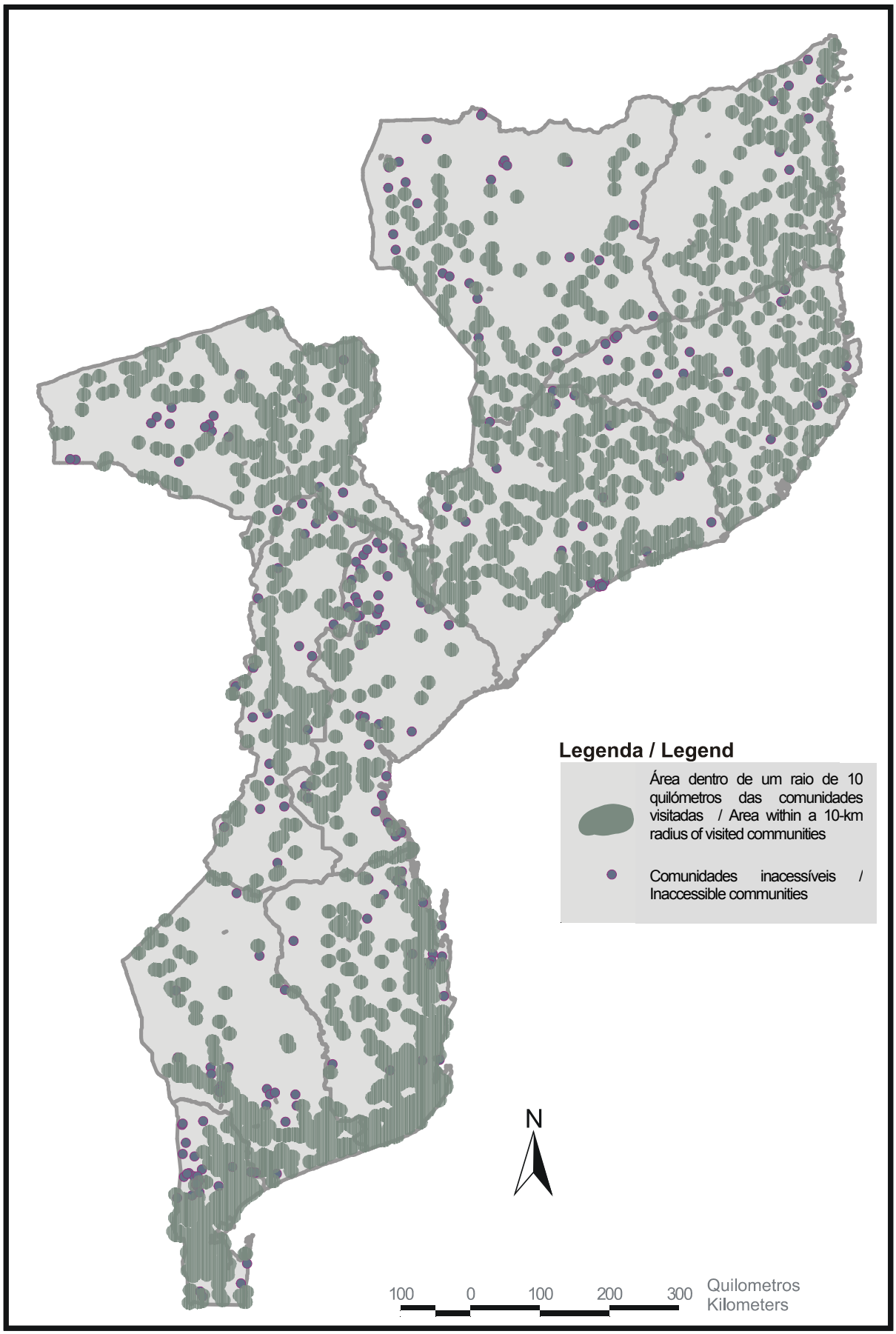
The number of inaccessible communities (208) was relatively high, but it is comparable to the limited data that are available from other surveys in Mozambique. The absence or poor condition of transportation infrastructure explained the majority of cases of inaccessibility.

Figure 16 shows that, in some cases, inaccessible communities were relatively close to other communities that could be visited. Nevertheless, information could not be collected about an area of approximately 40,000 km, representing about five per cent of the area of the country (Table 24). Inaccessibility was a particular problem in Sofala and Niassa provinces.

Table 24 INACCESSIBLE AREAS, BY PROVINCE

PROVINCE	Inaccessible Areas (km^2)
CABO DELGADO	1,873.7
GAZA	3,216.5
INHAMBANE	2,572.6
MANICA	4,301.2
MAPUTO	3,010.2
NAMPULA	3,434.3
NIASSA	6,502.5
SOFALA	7,464.8
TETE	3,717.9
ZAMBEZIA	3,177.3
Total	**39,271.0**

Figure 16 INACCESSIBLE COMMUNITIES



ESTIMATION OF PREVALENCE OF LANDMINE-AFFECTED COMMUNITIES

Three approaches, two direct and one indirect, were employed to estimate the prevalence of landmine-affected communities. They were based respectively on the community, the Locality, and the areal coverage achieved by the MLIS.

If it is assumed that the communities sampled in a given District were representative of those not sampled, an estimate of the total number of landmine-affected communities in that District can be calculated by extrapolating the proportion of the sampled communities that are landmine-affected to the number of non-sampled communities.

Let $N = \Sigma N_h$ be the total number of non-suspected communities from which the samples are drawn, with N_h being the number of communities in the h^{th} District. The proportion (p) of affected communities (a) in a sample of n_h in a District is given by: $p_h = a_h/n_h$. The proportion of affected communities in all the Districts is: $p_{st} = N^{-1} \Sigma(h=1;128) N_h p_h$.

Applying the preceding formulae to the non-suspected communities yields $p_{st} = 0.31$, which is applied to 11,425-2,057= 9,378 to get 2,931 estimated landmine-affected communities among the non-suspected group, of which 261 (8.9%) have been identified.

The value of p_{st} is an estimated proportion that is based on a "random" sample and thus is subject to sample variation. The standard error of p_{st} can be calculated to provide a confidence interval for the number of affected communities in the non-suspected group. This is accomplished using the following formula:

$$se(p_{st}) = \sqrt{p_{st}(1-p_{st}) / n_h}$$

Calculating two standard errors (95%) for the proportion (Wild, C.J. & G. Seber. 2000. *Chance Encounters.* New York: John Wiley & Sons) translates into a range of 2,532 (lower bound) and 3,282 (upper bound) for the affected communities in this group.

Making the same calculation for the suspected communities yields $p_{st} = 0.521$. Applied to 2,057 suspected communities, it produces an estimate of 1,073 landmine-affected communities, of which 530 (49.4%) were visited. Using the 95-per cent confidence interval yields a range of 987 to 1,151 for the number of landmine-affected communities in the suspected group.

In total, therefore, the foregoing calculations suggest that the number of landmine-affected communities in Mozambique may be from 3,519 to 4,433, of which 791 (17.8% - 22.5%) were confirmed by the MLIS.

Our expectation is, however, that the actual number of landmine-affected communities may be towards or below the low end of the range. The MLIS identified a total of 1,374 SMAs. That represents a very high proportion (78.0%) of the 1,761 landmine- or UXO-affected areas that have been identified for the country as a whole by other sources (*Landmine Monitor Report*, 1999, p.53), especially when one bears in mind that at least 5% of the country was inaccessible.

Unless the number of landmine-affected areas in Mozambique has been consistently and significantly underestimated by sources other than the MLIS, it seems improbable that the MLIS would have identified some 78.0% of the mined areas (this figure is probably a minimum, because some of those 1,761 mined areas have already been cleared), but only 17.8% - 22.5% of the landmine-affected communities, unless most of those communities are affected by SMAs that the MLIS did not identify.

The resolution of this seeming inconsistency may lie partly in the fact that what are called "villages" in Mozambique are often not clearly defined, distinct units. Rather, they are dispersed residential groupings with diffuse boundaries that often merge imperceptibly with one another. The Locality, which is an administrative unit comprising on average 12 communities, may be a more appropriate unit for statistical analysis.

There are 1,198 Localities in Mozambique. A total of 460 of those Localities may be considered non-suspected and 738 suspected.

Let $N = \Sigma N_h$ be the total number of non-suspected Localities from which the samples are drawn, with N_h being the number of Localities in the h^{th} District. A Locality is considered to be landmine-affected if at least one of the communities in it reported being landmine-affected in a group interview. The proportion (p) of affected Localities (a) in a sample of n_h in a District is given by: $p_h = a_h/n_h$. The proportion of affected Localities in all the Districts is: $p_{st} = N^{-1} \Sigma(h=1;128) N_h p_h$. $P_{st} = 0.284$.

The total number of non-suspected Localities from which all the samples are drawn is 460 (1,198 – 738). The total number of affected Localities from the non-suspected group (false-negative Localities) is 0.2836 * 460 = 130.46, of which 73 were identified by the MLIS.

The overall estimated prevalence among the 1,198 Localities in Mozambique is (460 + 130)/1,198 = 0.492, or almost 50%.

We can thus estimate that 130 – 73 = 57 Localities have not been identified, which means that (460 + 73)/(460 + 130) * 100% = 90.4% of all affected Localities have been identified.

Alternative insights into the extent of the coverage achieved by the MLIS can be gained by considering the spatial extent of the areas about which it gathered information.

Group interviews yielded information about SMAs as far away as approximately 20 kilometers from the communities where they were conducted. Nevertheless, some 94% of the reported SMAs were within 10 kilometers of the community in question.

One may assume conservatively, therefore, that a group interview in a community provided information about the territory defined by a 10-kilometer radius from that community. If the communities visited had all been more than 10 kilometers apart, information would have been available for 543,079 square kilometers. Given the proximity of many of the communities to one another, we estimate that information was collected, often from more than one source, for an area of approximately 320,000 square kilometers. The high degree of spatial overlap is beneficial from two perspectives: it compensates for the assumption that the territory known to the residents of each community is roughly circular; and it protects against the danger that the radius of 10 kilometers is unrealistically high.

If one assumes, less conservatively, that visits to communities provided information about the territory defined by a 15-kilometer radius from that community, the area for which information is available would increase to some 506,000 square kilometers.

The area of the 12 cities and two islands that were accepted as being free of the impacts of landmines on the basis of expert opinion is approximately 4,000 square kilometers.

As noted earlier, the size of the inaccessible areas is at least 39,000 square kilometers. In the case of individual inaccessible communities, that area was calculated using a radius of 10 kilometers from the reference point in the community, and the total area was adjusted to take into account territorial overlaps between adjacent communities.

Finally, the absence of communities and significant road infrastructure suggests that at least 50,000 square kilometers of Mozambique are currently unoccupied and were probably unoccupied when mines were being laid. Unoccupied areas had to meet the following criteria: no community name recorded in the toponymy database; no significant transportation infrastructure shown on any map; no community within a distance of 20 kilometers; minimum size of 200 square kilometers. It is likely, therefore, that the figure of 50,000 square kilometers significantly underestimates the size of the unoccupied areas.

The unoccupied areas are concentrated in north-central Niassa Province and west-central Cabo Delgado Province, but there are several such areas in Gaza and Tete provinces, and a small number in each of the other provinces except Nampula Province. Even if mined areas occur in

these regions, the absence of human presence means that they can be considered as impact-free.

From a spatial perspective, the situation may be summarized as follows:

Total area of Mozambique	799,380 km^2
Area accepted as impact-free	4,000 km^2 (0.5%)
Inaccessible areas/no information	>39,000 km^2 (4.9%)
Area deemed unoccupied and impact-free	>50,000 km^2 (6.3%)
Area covered by the MLIS	320,000 km^2 (40.0%) – 506,000 km^2 (63.3%)
No coverage	<200,380 km^2 (25.1%) - <386,380 km^2 (48.3%)

In summary, therefore, through the analysis of the available data and visits to 1,729/11,435 (15.1%) of the communities in Mozambique, the MLIS was able to offer reliable information about the landmine status of 50% - 70% of the surface area of Mozambique. That finding is broadly consistent with our estimate that the MLIS identified some 80% of the mined areas that are believed to exist.

The practical importance of visiting every landmine-affected community can be overstated, for two reasons.

First, the purpose of an LIS is to provide the national authorities with an additional, impact-based planning tool for mine-action. The 791 landmine-affected communities identified by the MLIS are distributed throughout all 10 provinces, thus satisfying the need for data with which to formulate a nation-wide plan. Realistically, resolving the social and economic problems that the 791 communities identified through mine-clearance or other activities is likely to take seven to 10 years, assuming that generous funding and technical assistance are forthcoming. Ten years is probably the longest realistic planning horizon that can be adopted. Even if more landmine-affected communities had been identified, it is unlikely that the resources to address their problems could be mobilized in the short term. We recognize, however, that some such communities might have been high priorities under the Mine Impact Score or other indices.

Secondly, it is virtually certain that many of the landmine-affected communities that could not be visited are affected by one or more of the SMAs that were identified. There are, for example, 4,296 communities within a radius of 10 kilometers of the 1,374 SMAs identified, and it is likely that they account for a high proportion of the 2,728-3,642 unvisited landmine-affected communities that may exist. If the SMAs that were identified are demined or otherwise addressed, the beneficial impacts will be felt not only in the 791 communities that reported impacts from them, but also the other communities that are also experiencing impacts from them.

Management Team Report

SUMMARY

This report outlines some of the significant experiences of the CIDC's management team during its conduct of the MLIS. It focuses on key operational and managerial issues, addresses a number of important lessons learned, and makes a limited number of recommendations for users of the MLIS, for parties engaged (or to be engaged) in similar surveys elsewhere, and for donors.

The MLIS presented significant challenges on many levels. Its successful completion depended on the assistance and cooperation of individuals and organizations too numerous to name here, but whose contributions are highlighted in the *Key Participants* and *Acknowledgements* sections. Of particular note were the contributions made by Sr. Artur Domingos Veríssimo, Director of the IND, and by representatives of the CIDA, the UNMAS and the SAC. In addition, independent program monitors, Michel Cipiere (the UNMAS and the SAC) and Georges Focsaneanu (the CIDA), provided invaluable guidance, counsel and support. Most of all, though, the MLIS owed its success to the skill, diligence and perseverance of its Mozambican personnel.

In conducting the MLIS, survey teams interviewed approximately 13,000 persons, traveling over 800,000 kilometers, mostly on unpaved roads and bush tracks, attempting to visit 1,973 predominantly remote communities throughout every Province. Floods, malaria, and extremely difficult road and communications conditions proved to be special challenges. Fieldwork took 14 months to complete, but it yielded critical information that has been entered into the IMSMA database and transferred to the IND.

Photograph 7: Rudimentary Bridge

As a democracy, at peace, with a mature mine-action infrastructure, Mozambique stands to benefit greatly from the information gathered and from the indigenous capacity built through the conduct of the MLIS. Mozambican authorities, mine-action practitioners and donors now have important additional tools with which to better plan, prioritize, coordinate and evaluate future mine-action initiatives throughout the country. Indeed, the results obtained by the MLIS are already being utilized for demining operations and to assist with development activities such as rural water projects and research.

Photograph 8: Washed-Out Road

High standards of performance in the areas of staff selection, training, supervision, logistics support and quality assurance are preconditions for success in any LIS. In the case of the MLIS it was also essential that management, both inside and outside Mozambique, proved capable of reacting rapidly, decisively and sometimes creatively to deal effectively with unforeseeable events as they occurred.

The MLIS was conducted within the guidelines and standards established for national LISs by the UNMAS, and survey outputs and methodologies were submitted to the United Nations Certification Committee, which subsequently certified the MLIS.

It is hoped that the contents of this report will assist in the management of future LISs.

OBSERVATIONS

ADMINISTRATION AND LOGISTICS

Administrative Set-Up

The successful early recruitment of senior in-country personnel combined with the services provided by the CIDA Project Support Unit ("PSU") in Maputo, facilitated a relatively trouble-free establishment of initial operations. Arrangements for office and residential accommodations, bank accounts, utilities services and initial staffing were completed in a timely manner and without undue difficulty. The services of the PSU were particularly helpful in regard to procedural and statutory matters during this early phase.

The only problem of real significance related to procedures for the duty-free importation of vehicles and equipment required for the MLIS. Prior agreement had been reached on this matter by the governments of Mozambique and Canada, but there remained a lengthy process to complete import transactions.

Travel

The size of Mozambique and the ubiquitous nature of its landmine problem required survey personnel and support staff to log, in aggregate, over 800,000 kilometers in domestic and regional travel to complete the MLIS. Access to certain communities required traveling also through adjacent parts of Malawi, Zambia and Zimbabwe, while procuring supplies and equipment required travel to South Africa and Swaziland.

Photograph 9: Broken Bridge

Personnel

International: Project staff at inception comprised two full-time positions (*Mine Action Supervisor* and *Analytical Services Coordinator*) supported by three part-time managerial and technical oversight positions (*Executive Director*, *Analytical Services Supervisor* and *GIS Supervisor*). Two additional full-time positions (*Program Coordinator* and *GIS Coordinator*) were filled during the early stages of mobilization. These seven positions, together with the national position of *National Survey Director*, were primarily responsible for project planning and preparation.

Subsequent international appointments in Mozambique, at various phases of the MLIS and with evolving mandates, included the positions of *Program Director* (replacing the *Program Coordinator*), *Field Survey Coordinator* (replacing the *Mine Action Supervisor*), and *Survey Liaison Officer*. The final complement of international personnel was four full-time positions in Mozambique (*Program Director*, *Field Survey Coordinator*, *Analytical Services Coordinator*, and *GIS Coordinator*) supported by six part-time support positions in Canada (*Executive Director*, *Analytical Services Supervisor*, *GIS Supervisor*, *Analytical Services Advisor*, *Operations Officer* and *Administrative Manager*).

Due partly to the length of the MLIS and partly to its challenges, a significant turnover of international personnel was experienced: six international staff members were replaced or re-tasked during the course of the MLIS. This level of turnover had temporary negative consequences for program management and productivity, but competent replacement personnel were deployed on a timely basis, and no lasting material impact was felt.

National: Selection of candidates to be screened for the project's most senior national position, *National Survey Director*, was made prior to the Inception Mission on the basis of references provided by mine-action contacts in Maputo. During the Inception Mission, candidates were interviewed, and the position was filled. Successful recruitment for this position at an early stage proved to be a major benefit for the program. It facilitated liaison with key Mozambican authorities at all levels, and the fact that the incumbent remained with the project throughout provided invaluable continuity.

Interview, selection and recruitment processes for all other national positions were completed through a combination of referrals from other mine-action organizations and widespread newspaper advertising. Approximately 400 applications for field positions were received from virtually every region of Mozambique. A meticulous screening process was followed by interviews and aptitude tests for approximately 200 candidates and final selection of 42 candidates for training. A serious attempt was made to recruit staff from all geographic regions of the country, but access to media, advanced education and transportation for interviews resulted in an imbalance in the final numbers in favor of persons from the Maputo area and other southern regions.

An important element in the selection process for all field positions was the conduct of training under simulated field conditions at a relatively remote field camp generously provided by the ADP. This environment enabled instructors to monitor the ability of trainees to cope with field conditions and to assess their capacity to interact with fellow candidates in team roles.

Recruitment of staff for data-processing and administrative positions was made primarily from candidates referred by the NGO and academic communities in Maputo. In addition to technical competence, selection criteria included language skills and work ethic.

The average number of Mozambican nationals employed throughout the program was approximately 60 (one in a senior management position, six in administrative and logistics support roles in Maputo, six in data-processing and analysis functions in Maputo, and 50 in data-collection and field support positions). Most nationals employed in data-processing and analysis and many of the field survey staff had university or other advanced education.

Role of Women: As a matter of CIDC policy, all positions were open to women. Only seven women applied for field positions out of approximately 400 total applicants. All seven were invited for interviews and were found to be qualified, but all declined the opportunity to participate in training on the grounds that they felt that the working conditions and the lengthy periods away from home would be unsuited to their personal or social situations. One of the international staff was, however, a woman, and she spent considerable periods in the base camps and traveling with survey teams. Her participation in group interviews and camp life was never problematic. Thus, other things being equal, the logistical arrangements were capable of accommodating women.

Three of the six Mozambican members of the data-entry and processing staff were women, as were two of the four members of the administrative staff. Without exception, their performance was of the highest caliber.

Equipment

Pursuant to an agreement between the CIDA and the Government of Mozambique, most items of equipment remaining at the conclusion of the MLIS were inventoried by the CIDC and were donated by the CIDA to the IND.

Comments on the CIDC's procurement and utilization of specific categories of equipment are as follows:

Computer Equipment and Peripherals: Although certain items of electronic equipment were available locally in Mozambique, they tended to be relatively expensive, and maintenance services were often deficient. Accordingly, in order to expedite the MLIS at a reasonable cost, some electronic equipment was initially shipped from Canada. Alternative sources of additional equipment, replacement parts, maintenance, and consumables, at competitive prices, were ultimately found regionally, and were fully utilized.

Digital Cameras: Each survey team was supplied with a digital camera with which to record group interviews, reference points for mapping purposes, and key points (turning points, junctions, etc.) on the way to and from landmine-affected communities. Initial utilization of these cameras was found to be unsatisfactory, and a photographic competition was introduced as an incentive to improve both the quality and number of images produced.

Geographic Positioning System ("GPS"): The GPS units used (Garmin GPS12) proved quite adequate for recording geo-referenced information. A point of known latitude and longitude was established at each base camp, at which survey teams could check the accuracy of the readings of their GPS units.

Geographic Coordinates

Coordinates were recorded in the field using degrees, minutes, and seconds in WGS84. When they were entered into the IMSMA database, however, they were automatically converted into decimal degree. Demonstrations of the IMSMA database to potential users revealed that they sometimes failed to appreciate that the coordinates were in decimal degrees, especially when they were comparing data in the IMSMA database with those in other databases that present coordinates in degrees, minutes, and seconds.

Vehicles

In order to cope with the terrain and road and weather conditions, to travel the great distances required, to carry the heavy loads, and to operate in the remote environments inherent in the MLIS, the CIDC required an automotive fleet that comprised predominantly four-wheel drive utility vehicles and pickups.

Photograph 10: Survey Vehicle

Initially the fleet was made up of:

Number of Units	Make and Model	Type	Seating Capacity	Condition	Primary Utilization
6	Mitsubishi Pajero - 4x4	Utility	9	New	Field survey
2	Mitsubishi L200 - 4x4	Pickup - Single-cab	2	New	Field support
3	VW, Toyota, Mazda	Cars	4 - 5	Used	Office support

The new vehicles were purchased from a distributor in Europe, based on criteria that included price, delivery lead-time and performance. Each unit was purchased with a one-year spare parts package recommended by the manufacturer. Each utility vehicle had a designated professional driver, one pickup was driven by the Camp Manager and the other by the Paramedic. A full-time field mechanic was recruited to supervise the maintenance of all field vehicles. He traveled with the field teams throughout the country and proved invaluable in minimizing vehicle downtime.

The three Maputo-based cars were maintained under contract with a vehicle workshop in the city, and were driven by senior staff members.

Prior to undertaking fieldwork, one utility vehicle was stolen and was not recovered. Shortly after commencement of the survey in Nampula Province, another utility vehicle was damaged beyond repair in an accident. An initial replacement was obtained by purchasing regionally a used Isuzu twin-cab pickup, but the combination of reduced fleet size and the need to increase survey productivity resulted in a decision to purchase five additional utility vehicles from a Mozambican distributor. These were:

Number of Units	Make and Model	Type	Seating Capacity	Condition	Primary Utilization
4	Landrover Defender 110	Utility (TDI Hardtop)	9	New	Field survey
1	Landrover Defender 110	Utility (TDI Hardtop)	9	Used	Field survey

The selection criteria for these vehicles were similar to those used earlier, but two additional factors were considered: the ready availability of locally stocked spare parts and regional maintenance capabilities; and the willingness of the supplier to enter into a buy-back agreement. In the event the buy-back option was not exercised, because the CIDA agreed to add these supplementary vehicles to the inventory to be transferred to the IND upon completion of the MLIS.

A second utility vehicle was damaged beyond repair in an accident while operating in Zambézia Province. Both accidents were single-vehicle in nature and resulted, to some degree, from driver error. They both caused injuries to vehicle occupants, but fortunately there were no fatalities. As was the case with the stolen vehicle, insurance claims were collected in respect of both accidents on policies carried with Lloyds underwriters.

Additional vehicles were leased from time to time to support base camp moves or for other short-term transportation requirements. The frequency and costs of such leases were minimal.

Finally, two 125-cc motorcycles were purchased in Mozambique to provide efficient transportation for Pre-surveyors.

Customs Clearance of Equipment

Under the terms of a Memorandum of Understanding between Mozambican and Canadian government authorities, it had been agreed that project equipment would be imported into Mozambique free of import duties or taxes. This required that an internal agreement on the amount of duty or tax offsets be reached between the IND and the Ministry of Finance. That process took about four months to complete. As a consequence, the importation of most major items of equipment was delayed until September and October 1999. Once this problem was resolved, the actual clearing process, although bureaucratic, was relatively smooth. In many cases, the alternative of buying or leasing major items of equipment locally was not a viable option.

Communications

The primary, and most cost-effective, means of communication among all the CIDC units and with the many MLIS stakeholders was e-mail. The *Field Survey Coordinator*, operating from a mobile camp, was provided with a designated e-mail address through a local server that could be used at any location with a telephone line. Secondary communication was by telephone and facsimile, and additional, non-confidential communication within Mozambique was maintained by passing written or verbal messages through staff rotating in or out of field locations. During the course of the MLIS over 10,000 e-mail transmissions were logged among the various offices, camps and stakeholders involved.

The quality and reliability of HF/VHF radio communications between field teams and base camps and the CIDC's Maputo HQ was found to be seriously deficient. Initially, the allocation by the Mozambican Ministry of Communications of frequencies in the lower range of the spectrum was a limiting factor. A further range of frequencies was subsequently allocated but the improvement was not significant. The only satisfactory solution was to equip the field teams and base camp with satellite telephones.

After conducting trials that proved their effectiveness and reliability, 10 satellite phone units (Mini-M system) were purchased. All users were required to abide by a strict utilization policy designed to control costs, and they consequently proved to be very successful and relatively cost-efficient.

Field Accommodation & Food

Accommodation was provided for all field personnel in base camps and team camps. Initially it was planned that base camps would be located in or near each provincial capital. Driven by productivity considerations as the MLIS progressed, however, greater use was made of remote

team camps to reduce the time, expense, effort and difficulty of relocating base camps frequently.

Base camps were situated in: Nampula City, Pemba, Lichinga, Gurue, Quelimane, Chimoio and Cumbana. Chimoio, the capital of Manica Province, served as the base camp for the central provinces of Tete, Manica and Sofala. Operations in the central provinces were also supported by regional camp and administrative facilities provided by the NPA.

Photograph 11: Setting-Up of Base Camp

All base camps were located on sites generously provided free of charge by provincial, municipal, or church authorities. They comprised tents and other temporary facilities for washing, latrines, cooking, dining, vehicle workshops, administration, relaxation and medical treatment. Electrical power for office equipment, rechargeable batteries (satellite telephones, GPS units and digital cameras), refrigerators, freezers, lighting, power tools, radios, tape players, television and video player was provided either by portable generators or by mains power supplied by the site's host. Locally recruited guards ensured the security of personnel and goods.

For the first seven months of field operations, food was provided for all field staff in the base camps by two full-time cooks and locally recruited assistants. Teams operating remotely were given a daily cash allowance to buy and cook food for themselves. Subsequently, as greater use was made of remote team camps, a cash allowance system was introduced for all field

personnel regardless of their location. It greatly simplified base camp logistics and contributed modest cost savings with no adverse consequences.

Accommodation in team camps comprised light, two-person tents for each team. Team camps were usually established in District Administrative Posts near the communities being surveyed.

Security

Throughout the period of the MLIS, Mozambique experienced no significant civil unrest or conflicts. Field teams, including international staff, were allowed to travel freely throughout the country. No major security problems were experienced.

The greatest threats to the safety of the survey teams came from landmines, vehicle accidents, snakebites, and disease. In addition, a small number of incidents of theft (most notably a utility vehicle) and personal harassment or physical abuse were experienced. Although traumatic, none of these incidents had serious lasting consequences.

Mine-awareness and basic first-aid training were given to all field personnel. A paramedic with a comprehensive pharmacy and a dedicated vehicle was on standby in the base camp at all times, and field personnel were provided with insurance coverage against accidents, including evacuation services. Field teams were provided with satellite telephones that allowed them to communicate with the base camp and with the CIDC's HQ as required.

There were no incidents of snakebites. Where snakes were observed or suspected at the base camps, preventive measures were taken.

No landmine accidents occurred, but there were two serious vehicle accidents, as a result of which four field personnel had to be hospitalized. All subsequently recovered.

Despite the implementation of numerous preventative measures, including medication, mosquito nets and repellants, there were numerous cases of malaria, often with the result that 20% of the workforce was incapacitated at the same time.

Given the reportedly high rates of HIV/AIDS infection, free prophylactics were distributed upon request to all field personnel to reduce the risk to them and to others.

There were no fatalities among staff for any reason.

COORDINATION

Between CIDC Mozambique and CIDC Canada

Given the reliability of telephone and email communications, no problems were experienced in functional communication and coordination between management and technical support team members in Mozambique and Canada. The major challenge in terms of communication arose from the fact that there were five major components to the survey management structure: CIDC executive and project oversight functions in Nova Scotia; Analytical Team oversight functions in Montréal; Project Management in Maputo; Data-Processing and Analysis at a separate location (within IND) in Maputo; and a mobile field management unit that traveled throughout the country. This geographically dispersed management structure, combined with the turnover in certain personnel, created a greater number and complexity of communication channels than would normally be desirable and presented challenges of unit cohesion from time to time. Coordination between analytical unit personnel in Montréal and Maputo was generally satisfactory.

Within CIDC Mozambique

The management structure in Mozambique was based on a head office staff located at Av. 25 de Setembro in Maputo, a data-processing and analysis unit at the IND offices in Maputo, and a mobile field management unit to oversee and support the data-collection process. Given their separate locations and turnover in certain key staff positions, effective coordination between the Maputo head office and the analytical unit took some time to achieve. For reasons beyond the control of either, the desired level of coordination between the data-processing and analysis unit at the IND and the mobile field management cell was not achieved in the early stages of the project.

Regular field visits by Maputo-based project management personnel plus routine field staff rotations to and from Maputo permitted a satisfactory flow of survey materials to and from the field units. A functional system of control and chain of custody over survey documents and supporting materials was maintained throughout. Field financial requirements were generally served through bank transfers to provincial bank branches, and no significant difficulties were experienced.

Care was taken to select mobile regional base camp locations with reasonable access to electricity, e-mail and telephone services, and other support facilities. In several locations, the CIDC benefited greatly from the cooperation of municipal authorities, NGOs and churches in satisfying some of these basic needs. The cooperation of Provincial authorities was vital for coordination efforts in every Province.

Given the widespread nature of the landmine problem in Mozambique, the distances involved and the condition of roads and other communications infrastructure, the physical exchange of data, survey materials, financial records and other field requirements was accomplished quite successfully.

Government Authorities and Other Stakeholders

Mine-action in Mozambique is coordinated by the IND. Much of the country's demining activity is carried out by three regional organizations: the HALO Trust ("HALO"), operating in the northern provinces; NPA, covering the central provinces; and the ADP in the southern provinces. In addition, numerous commercial demining companies work on a contract basis throughout the country. All of those organizations represented sources of relevant data for the MLIS. Similarly, numerous government departments plus regional and national NGOs and UN agencies were important sources of information. Accordingly, the CIDC developed good relationships with as many of those bodies as possible.

Despite concerted efforts by the CIDC and others to explain the objectives, methodologies and outputs of the MLIS, misunderstanding appears to persist in some quarters. Of special concern is the apparent inability, among some, to understand that the role of the impact assessment component of the MLIS is limited to collecting the perceptions of community residents of the impacts of landmines on themselves. In the jargon of environmental impact assessment, an LIS corresponds to a screening or an initial assessment rather than to an in-depth assessment. This distinction needs to be more widely appreciated.

On a more positive note, the direct interest and involvement of the Minister of Foreign Affairs and Cooperation and of the Director of the IND in the MLIS bode well for its future effectiveness in national mine-action.

With CIDA

The original cost estimates and timeframe established for the MLIS by the CIDC and the CIDA required significant review and modification based on actual circumstances encountered during project implementation. The CIDC was the fortunate beneficiary of the constructive engagement of the CIDA in developing solutions necessary to expedite the MLIS. The coordination efforts required between the CIDC and the CIDA, and the consequent cooperative relationship that was achieved, were a particular and key feature of the MLIS.

Quality Assurance Monitor

Two successive QAMs provided quality assurance based on the UNMAS certification guidelines. The first served until October 1999, and the second from November 1999 until the completion of the MLIS. The first QAM was an employee of the SAC who served on an interim basis only. The second was under contract to the SAC from November 1999 to October 2000,

after which his services were contracted through the United Nations Office for Project Services ("UNOPS") on behalf of the UNMAS. Both served on a part-time basis.

The first QAM visited Mozambique once for an eight-day period, primarily to review preparatory arrangements and to monitor the training program for field personnel.

The second QAM visited Mozambique on six occasions for a total of approximately 21 weeks, dividing his time between Maputo and the field in accordance with the evolution of the MLIS. The visits of the QAM were chosen to coincide with critical events, such as training of field and analytical staff, field testing, the deployment of survey teams to the field, the start of data-entry, the preparation of the first Provincial Report, the drafting of the National Report, and demobilization/handover. Communications between the QAM and key project managers and technical support personnel were maintained by e-mail and telephone between visits.

The absence of a full-time QAM was not considered disadvantageous. Indeed, it permitted the QAM to bring a level of objectivity and innovation that might have been more difficult to attain if he had served on a full-time basis, and it avoided any possible appearance of his being co-opted.

The relationship between the QAM and the CIDC team was harmonious, productive, and mutually respectful, in large part because of the positive attitude of the QAM. Without compromising his objectivity, he was able to act as a contributing member of the Survey team, albeit a member of unique standing, rather than being merely an "outside" observer or critic.
The QAM interacted regularly with virtually every member of the CIDC team, living and traveling with them when he was in the field, and making regular visits to the administrative and analytical offices when he was in Maputo. He also maintained regular communications with the IND and the CIDA representatives in both Mozambique and Canada. Given his lengthy experience in numerous facets of mine-action and the fact that he had previously spent almost two years in Mozambique, the QAM was able to provide numerous helpful insights and suggestions.

His engagement in the process and consequent reporting facilitated timely discussion internally and liaison with the UNMAS and the SAC regarding key methodological and procedural issues.

The MLIS also benefited greatly from the experience, assistance, and periodic interventions of the CIDA's program monitor, Georges Focsaneanu.

Reporting

External: Reporting to stakeholders (primarily the IND, the CIDA, the UNMAS and the SAC, but also the wider mine-action community) occurred throughout the MLIS in various formats. These included: periodic written and verbal reports by the CIDC's *Executive Director* and

Program Director addressing project progress and amendments to plans; formal and informal presentations made by senior CIDC personnel at a number of venues in Mozambique, South Africa and Canada; and attendance at forums hosted by the SAC in Washington and Geneva for the purpose of discussing "lessons learned" among all of the ongoing national programs under the GLS.

Timely reporting on findings was provided on a province-by-province basis for the IND, the CIDA and the QAM. Initially, a comprehensive report on the first Province completed (Nampula) was prepared in February 2001 in order to give the IND, the CIDA, and the QAM a comprehensive view of the methodology employed, the nature and quality of the data collected and the types of analysis that could be conducted, as well as to solicit the suggestions of the IND for weighting the variables in the Mine Impact Score. Between March and June 2001, executive summaries in English and Portuguese were produced for the remaining nine Provinces.

Internal: A comprehensive system of internal reporting, based predominantly on completing prescribed forms, was implemented to cover routine logistical, financial and administrative matters and to resolve methodological issues as they arose.

Local Capacity-Building

A LIS is not primarily a capacity-building initiative. Nevertheless, a successful LIS requires the training of nationals in the full range of skills required to collect, enter and analyze survey data. Self-interest alone suggests that the body responsible for using the survey data for future planning and programming, in this case the IND, would wish to benefit from the training and experience acquired by those nationals.

The MLIS contributed to local capacity-building by training and employing approximately 60 Mozambican nationals as senior administrative staff, logistics officers, field supervisors, interviewers/recorders, data entry/processing personnel, secretaries, and bookkeepers. It should be noted that the quality of the national personnel trained and employed, and of their outputs, was generally very high.

Training in data-entry and processing was also offered to the staff of the IND. The CIDC's efforts at capacity-building were enhanced by the fact that its data-entry and processing personnel shared space with the staff of the IND. Subsequent to their completion of work for the CIDC, three data-entry staff were retained by the IND, and at least one other has been employed by the National Institute of Statistics ("INE").

In order to assist the IND to exploit to the fullest the planning and programming potential of the data collected during the Survey, the CIDA has provided funding through the UNDP for further technical assistance.

OPERATIONS

Training

Field Staff: Classroom training for the field staff was given over a four-week period at a camp in Moamba, Province of Maputo, belonging to the ADP. Those trainees who successfully completed the classroom training received a further two weeks of training during field-testing in Matutuíne District, Province of Maputo. Some modifications to the survey instruments and procedures were made as a result of the field-testing. Moreover, there was an unavoidable delay of some three months between the completion of the training and the deployment of the teams to the field, in part because of the national election, the Christmas vacation, and the widespread flooding. Consequently a further five days of classroom training were given in Maputo before the teams left for the field.

The following figures encapsulate the results of the initial training program: 32/42 candidates selected for the classroom training reported to the training camp on time; 5/32 trainees dropped out during the first two weeks of training, for personal reasons or because of illness or their inability to master the curriculum; 4/27 students failed the classroom training; and two students failed the field-testing portion of the training.

The long-term success of the training program was reflected not only in the excellent performance of the field staff, but also in the low post-deployment rate of attrition: despite the fact that the field staff were living in tents and operating under physically demanding and occasionally dangerous conditions for some 14 months, only four resigned, and only two were terminated.

Some of the more important lessons of the training program are:

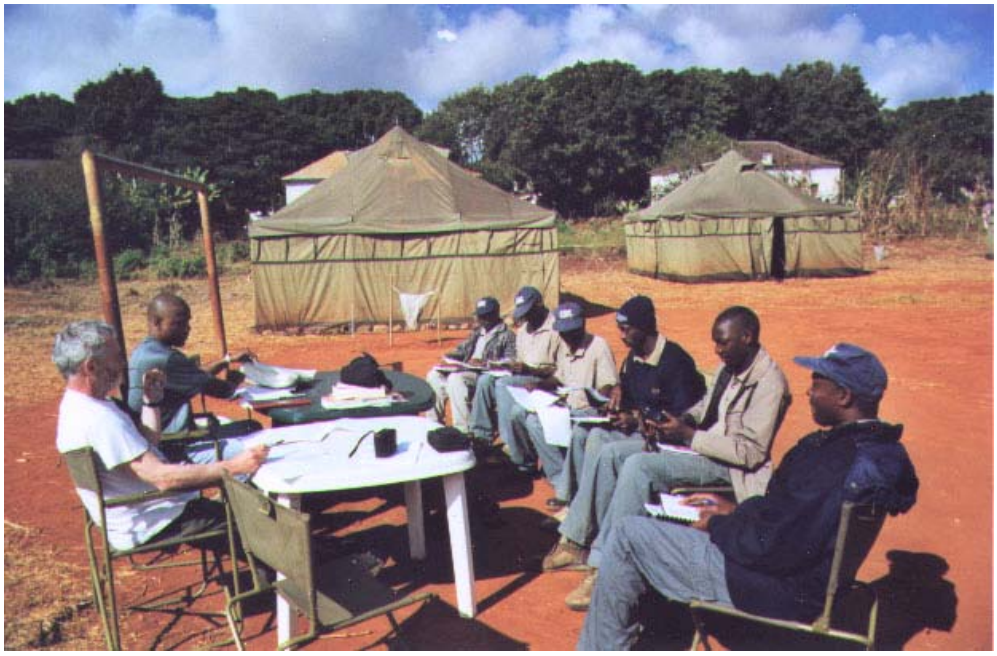
- Holding the classroom portion of the training in a camp setting proved to be a particularly good decision: not only did it create an atmosphere conducive to learning, but it also provided the instructors with an opportunity to test the capacity of the trainees to operate in the type of social and physical circumstances that they would encounter in the field.
- Requiring the trainers to live in the camp under essentially the same conditions as the trainees allowed them to assess their own ability to function efficiently for long periods under difficult field conditions and ensured their constant availability to observe, evaluate, counsel and support the trainees.
- Making the field-testing a component of the training program provided the opportunity to evaluate the ability of the trainees to apply the lessons learned in the classroom under sustained real-life conditions and allowed the trainers to confirm their preliminary

judgments as to the ability of the trainees to cope with the physical and psychological pressures of life in the field.

- Many trainees showed a propensity to wish to learn things by heart without, however, genuinely understanding them. Survey teams in a large country such as Mozambique must, however, be capable of working for long periods with a very high degree of autonomy, which requires that they fully understand what they are doing and why they are doing it. Asking the trainees to explain concepts and methodologies to their colleagues in the presence of the trainers was one of the methods used to ensure that they had the necessary understanding.
- Not surprisingly, some students proved to be quicker learners than others. We therefore instituted a mentoring system, which had the following benefits: it enhanced the self-esteem of the student-mentors and put pressure on them to attain full mastery of the course material; it improved the performance of the slower learners; and it reduced the pressure on the trainers.
- Checklists of common mistakes were distributed periodically to the trainees.
- Simulations and practical exercises, especially for such matters as conducting group interviews and using a global positioning system, proved to be popular and effective.
- Students were paid a weekly stipend equal to approximately 50% of the salary of an interviewer, and their living and travel expenses were also covered.

Refresher training was conducted periodically on an as-needed basis almost until the end of the fieldwork. The need for refresher training was evaluated principally through checking completed Village Survey Questionnaires and by observing teams in action. In some cases, refresher training was given to all of the field personnel simultaneously. In other cases, it was given only to those individuals who required it.

Photograph 12: Refresher Training of Field Supervisors



Staff recruited after the start of the MLIS received theoretical and on-the-job training in the field. They worked under close supervision in a mentoring relationship with more experienced personnel until the supervisory staff were satisfied with their competence.

Data-Entry Staff: The number of data-entry staff was relatively small (4-6 at any given time), and they were not all recruited simultaneously. Their training was, therefore, designed and administered largely on an individual basis, taking into account their prior education and experience. Simulations and practical exercises were the primary technique, and all new employees worked under the supervision of a mentor until they had demonstrated full mastery of their assigned tasks. Refresher training was given on an as-needed basis, and weekly training sessions on specific themes were organized. Peer review sessions were also employed as a training tool, especially to ensure consistency in interpreting the answers to the open-ended questions on impacts. Finally, the data-entry staff were given the opportunity to observe a group interview to enhance their understanding of the context in which the data that they were entering were collected.

National Gazetteer

A national gazetteer that, at a minimum, lists the official name of each community and gives its unique identification number and its geographic coordinates is a prerequisite for a LIS. Without a national gazetteer, reconciling information from different sources, planning and executing group interviews, entering data into the IMSMA database, and sharing information unambiguously with other parties are always difficult and often impossible.

Shortly after mobilization for the MLIS began, it became apparent that a complete and current national gazetteer did not exist. With the assistance of the INE, the CIDC and the USAID compiled a national gazetteer, based on the results of the 1997 national census, in the form of an electronic toponymy database. Compiling the database required some 12 months of effort, including assigning four of the CIDC's staff on a full-time basis for approximately four months to digitize data.

The toponymy database contains for each of approximately 11,300 villages: official and alternate names; a unique numeric identification code for geographic coordinates; total population, broken down by sex and number of families; and administrative attribution (Province, District, Administrative Post, and Locality).

Producing the final version of the toponymy database required extensive cross-checking and validation of the earlier version, which were not completed until May 2001. Final adjustments meant that there were some differences from the versions that had been available when fieldwork was planned and executed and when the data were entered into the IMSMA database.

All such differences were resolved before the populated IMSMA database was transferred to the IND.

The toponymy database can be linked by census code to the socio-economic and other information collected during the 1997 national census, thereby permitting interested parties to carry out more detailed analyses of the impacts of SMAs than properly form part of this report.

National Maps

Up-to-date national maps of the scale and quality needed for group interviews do not exist for Mozambique. The CIDC created its own national cartographic coverage by electronically integrating data from a range of sources. It also devised a computer program that would generate a 36" by 24" 1:50 000 base map with each community to be visited at its center, and showing the names of adjacent communities and, where such data were available, features such as rivers, roads, and railways. A considerable part of each group interview had to be devoted to checking the accuracy of the data shown on the maps, such as the names and locations of communities, and adding other information, such as rivers and prominent landmarks, that was needed for the accurate mapping of SMAs.

Base Maps

The use of 36”×24” base maps with the village where the group interview was being held at the center and showing other communities and geographic features proved to be very successful. The base maps were mounted on an easel in front of the Interviewees. After the Interviewees had confirmed or corrected the names and locations of nearby villages and added missing features, they provided the Interviewer with the information needed to sketch SMAs at the correct location, size, and shape. The base mapping exercise aroused and held the interest of the Interviewees, and, drawing as it did on information with which they were intimately familiar, it put them at ease before complex or sensitive questions, such as those dealing with impacts or victims, were raised.

Survey Instruments

Village Survey Questionnaire: With a single exception, the original version of the VSQ underwent only minor revisions as a result of pilot testing and field-testing. It was translated into Portuguese without difficulty, but it had to be administered with the assistance of interpreters in 31 languages. It appears to have worked well.

The single exception related to the questions designed to elicit information on the socio-economic impacts of SMAs. When we designed the VSQ, there was no basis on which to choose between a checklist and open-ended questions for that purpose. The advantage of a checklist is that it reduces the danger that the Interviewees will overlook an entire class of impacts, although, given the large size of the interview groups and the training given to the

survey teams, we considered the likelihood of that to be low. The disadvantage of a checklist is that it might encourage the Interviewees to report impacts that either do not exist at all or that are of minor importance, although the Interviewers can be trained to reduce that possibility. The shortcoming of open-ended questions is that the Interviewees might overlook an entire category of impacts, although the Interviewers can also be trained to minimize that danger. We used the checklist approach in the first drafts of the VSQ. Some such differences would be reflected in the Mine Impact Score. Caution should, therefore, be used when comparing the Mine Impact Scores in countries that used checklists and those that used open-ended questions.

During the classroom training at Moamba, it became apparent that the trainees had difficulty with the checklist approach. For example, many of them had difficulty in grasping the distinction between the following categories: impact occurring; impact not occurring; not known whether impact occurring; and question inapplicable, such as a question about the impact of SMAs on fishing in a village without access to bodies of water containing fish. The same difficulty was encountered with the Interviewees during the pilot testing and the field-testing.

Consequently, the VSQ was modified to include only open-ended questions about impacts, based on the assumption that the Interviewees would mention only those impacts that are occurring today and that are important to them. In cases of doubt, the Interviewers were trained to ask circumspect questions designed to elicit full information without being in any sense leading questions. The results suggest that our approach worked well in the context of Mozambique, but checklists may work well in other LISs.

On rare occasions, our approach leads to the seeming paradox that the maps prepared during the group interviews seem to reveal impacts that the Interviewees did not themselves report. The two most obvious cases are maps that show electricity transmission lines or water pipelines that are mined. Since the villages obtained neither water nor electricity from that infrastructure, the Interviewees did not apparently consider the presence of those landmines as constituting a blockage impact on the infrastructure in question. We instructed our data-entry staff not to enter those blockage impacts into the IMSMA database, since the objective of the MLIS was to provide a community perspective on the nature and importance of the impacts of SMAs. Nevertheless, persons interested in knowing whether such infrastructure as transmission lines and pipelines are mined can retrieve the relevant information from the hard-copy files or the IMSMA database.

The approach that we chose creates a challenge for the data-entry personnel, since they must interpret the answers to the open-ended questions to correspond to what is essentially the checklist approach employed in the IMSMA database. In most cases, there was a clear correspondence between the responses to the open-ended questions and one or more of the categories in the IMSMA database. The less obvious cases were resolved by means of team

discussions, with the final decision resting with one of the supervisory personnel as a way of ensuring consistency.

Verification Sheets: Originally known as Discrepancy Sheets, the Verification Sheets listed the available information, such as location and the names of nearby villages, of each mined area identified by a source of expert opinion. Before closing a group interview, the survey team compared the SMAs identified by the Interviewees with those listed in the relevant Verification Sheets. If any discrepancies were noted, the survey team attempted to resolve them before the interviewees departed.

Coding Sheets: Coding sheets were not employed, partly because of the impracticality of accommodating and transporting field editors, but also because we feared the potential for error of inserting an additional activity between completing the VSQs and entering the data in them into the IMSMA database. It is true that field coding also offers an opportunity for identifying errors and omissions in the field, but we instituted a system whereby field teams checked VSQs for accuracy and completeness before they left the village, and supervisory personnel checked them again shortly thereafter. We also ensured that the accuracy of all of the data entered into the IMSMA database from each VSQ was checked at least twice, in addition to which we devised a series of computer routines designed to highlight seemingly anomalous entries. We believe that, in the context of Mozambique, dispensing with field editors and coding saved a considerable amount of time and money without in any way compromising quality.

Scoring Sheet: We did not use a field scoring sheet for calculating the Mine Impact Score, since the conditions under which we were operating made it impossible for the field teams to meet regularly to “compare notes”, and because we saw no justification for allowing the field personnel to adjust the Mine Impact Scores. The calculation of all Mine Impact Scores was done automatically after the data had been entered into the IMSMA database.

Standard Operating Procedures: Ten numbered SOPs were developed. They covered; Survey Introduction, Organization, Training, Safety, Medical, Technical, Communications, Quality Assurance and Administration and Logistics. The SOPs emphasized the safety, quality and efficiency aspects of all work carried out in the field and in Maputo.

The SOPs were reviewed periodically in order to accurately reflect the realities of the MLIS, and revisions were made as required.

Protocols: A series of 20 protocols was produced in English and Portuguese to provide unambiguous, step-by-step guidance to the survey teams on how to conduct every facet of the MLIS. They addressed the following topics, among others: administering the VSQ; selecting

communities to be visited; interviewing potential sources of expert opinion; conducting a group interview; false-negative sampling; and proximity verification.

Expert Opinion Collection

The first challenge encountered in collecting and analyzing expert opinion was completing it for each Province well in advance of the deployment of survey teams to that Province. That challenge arose from the need to recruit and train the required Mozambican personnel to collect the data and to process it into a form useful for the survey teams. There was no practicable way in which those employees could be recruited and trained in advance of the field personnel. Once the field personnel had been trained, however, the delay before they were deployed to the field had to be kept to a minimum for fear of losing them to other employment. Delays in importing computer equipment aggravated the situation. An already difficult situation was further complicated by the floods in early 2000, which dictated that the survey teams be deployed initially to Nampula Province rather than to Inhambane Province. It was not until fieldwork was executed in Zambézia Province that analysis of expert opinion had been substantially completed in advance of the start of fieldwork.

The expectations that expert opinion could be collected primarily in Maputo and secondarily in the Provincial capitals, and that it would provide information on landmine-affected and landmine-free communities rather than merely on the location of mined areas were not entirely fulfilled. Moreover, expert opinion is unavailable for large parts of Mozambique, but there is no way of knowing whether that is because such areas have never been surveyed, or because they have been surveyed and found to contain neither mined areas nor landmine-affected communities. Where expert opinion is available, much of it is to be found only at the District level, requiring extensive and time-consuming travel, often only to find that the concerned official is unavailable. Even in the Districts where it is available, expert opinion tends to be relatively general, usually relating to localities, groups of villages, or mined areas rather than to landmine-affected or landmine-free communities.

Where expert opinion in the form of existing databases was located, its reliability was variable. Little of it specifically identified landmine-affected communities (since that was not among the purposes for which it had usually been collected), and much of it existed only in hard copy, sometimes poorly organized, which required considerable time to transfer to a usable electronic format. In some cases, the situation was aggravated by the impossibility of photocopying records to bring back to Maputo to enter into the CIDC's electronic database.

As noted earlier, much of the information from databases and other sources could not be used, since the names used did not correspond with those collected from the INE and compiled into the toponymy database. Geographic coordinates were less useful than had been hoped: of the

3,546 entries in databases that could not be linked by name to the toponymy database, only 841 (23.7%) had geographic coordinates.

The absence or imprecision of expert opinion made it impossible to classify many villages as Probably Landmine-Free or Probably Landmine-Affected, which in turn created obstacles to False-Negative Sampling and to estimating by the application of statistical techniques the prevalence of landmine-affected communities.

The CIDC addressed the foregoing challenges by increasing the number of staff assigned to collecting expert opinion at the District level and increasing their mobility through the purchase of additional vehicles and motorcycles, by visiting as many villages as possible in areas for which expert opinion was not available, and by extending the period for expert opinion collection in the Districts, which lasted from March 2000 until February 2001, during which time 202 interviews were conducted and the three major databases were reviewed.

Prearrangement of Group Interviews

Our original plan called for the field supervisors to obtain permission from community leaders to conduct a group interview three to five days in advance. The combination of the great distances between communities and the poor road conditions made it impossible to do so. In most cases, however, it proved possible to convoke a meeting within approximately two hours of the arrival of a survey team in a community. That sometimes made it difficult to ensure the representativity of the group, especially the participation of women and others away at work. By the same token, it had the benefits of diminishing the potential for collusion among the Interviewees to identify SMAs that did not actually exist or to overstate or distort impacts, as well as making it difficult for community leaders to influence the composition of the interview groups.

Key Informants

When group interviews are conducted at short notice, it is difficult to ensure that the Interviewees are representative of their community. Several sources of imbalance are to be feared, the under-representation of women, either for socio-cultural reasons or, more prosaically, because they are at work in the fields when the group interview is conducted; and the over-representation of the larger – usually male - land-owners or of other high-status males, including elected officials, members of the locally dominant political party, merchants, or persons with above-average education, such as teachers and health and social workers. Similarly, the absence of certain age groups might distort the information obtained.

The absence of a statistically representative sample does not, of course, automatically mean that the information provided will be inaccurate or incomplete, but it raises that possibility with no way to resolve it. The absence of women is a particular concern, since the nature of their

domestic duties is generally thought to make them privileged repositories of information on the location of certain mined areas and some of their social and economic impacts.

The survey teams were trained to make every effort to ensure that the Interviewees were as representative as possible, bearing in mind the guideline that the number of Interviewees should not exceed approximately 15. They seem to have been successful: as is to be expected for village-based interviews, approximately 78% of the Interviewees were involved in farming, fishing, gathering and herding, but virtually every group of Interviewees contained representatives of other professions; women accounted for 1,189 out of 6,772 Interviewees, and at least one woman participated in some 54% of the group interviews; generally reflecting the demographic structure of Mozambique, persons between the ages of 15 and 44 years constituted roughly 60% of the Interviewees, but those between 45 and 59 years of age constituted 28%, and those aged 60 years and more constituted just over 12%.

Even if a statistically representative group of Interviewees is formed, bias may be introduced if one or a few individuals are allowed to dominate the group interview. That danger is particularly great when an interpreter is used: translating the technical terms that cannot be avoided even in a simplified VSQ is challenging for both the interpreter and the Interviewees; if some of the Interviewees speak Portuguese or another language that the Interviewer knows and that possesses a technical vocabulary, there is a temptation to use that language notwithstanding the presence of an interpreter, which has the effect of excluding all Interviewees who do not speak that language.

The Interviewers were trained to ensure that no Interviewee was allowed to dominate or, where such was unavoidable, to record it in the notes submitted with the completed VSQ. For certain important categories of information, such as the location and other characteristics of SMAs, a consensus code was noted on the sketch map made during the group interview.

Proximity Verification

When the MLIS was planned, proximity verification, or the visual inspection of SMAs from a safe distance, was not required for certification. Nevertheless, the CIDC volunteered to carry out proximity verification wherever it was safe and practicable to do so, since proximity verification permits the confirmation of some of the information collected during a group interview, such as the size, location, vegetation, and landform of a SMA, and the collection of supplementary information that will assist technical survey teams and others in re-locating it. Proximity verification does not, however, provide confirmation that a SMA is indeed mined.

The principal constraints to carrying out proximity verification were time and safety. Because of the size of Mozambique, the poor quality of the roads, and the frequent unavailability of fuel, drinking water and other essential supplies, the survey teams were frequently at or close to the

limits of their radius of operation. Devoting even an hour or two to proximity verification, or using a few liters of fuel to travel to and from a SMA, would frequently have compromised their productivity, or would have made it impossible for them to visit all of their assigned communities within the available time.

Proximity verification was conducted at 409 out of 1,374 (30%) SMAs.

Multi-Village Interviews

Early versions of the work plan for densely populated areas called for representatives of several communities to be brought to a central location, where a single group interview would be conducted. In that way, it was hoped to collect information from several thousand communities. That plan proved not to be feasible, for several reasons: local leaders did not have the authority to convoke members of other communities to their communities; transporting interviewees to and from the community where the interview was to be held was impracticable; and the time required to organize such central interviews would have been excessive.

False-Negative Sampling

The protocol for false-negative sampling devised by the SAC had to be adapted to the context of Mozambique. Given the absence and imprecision of much expert opinion, applying that protocol in its entirety would have required that a minimum sample of 2,816 communities (128 Districts*22 communities) dispersed throughout all 10 provinces be visited for purposes of false-negative sampling alone. Depending on the number of false-negative communities identified, cascading could have resulted in visits to several hundred – or even more - additional communities.

As noted earlier, the CIDC initially estimated that it would be able to visit approximately 1,800 communities. It exceeded that target by approximately 7%, but some 14 months of fieldwork were required to visit 1,729 communities and to ascertain that a further 244 communities were inaccessible, did not exist, or were unable to participate in the MLIS. The available time and resources did not permit a significantly greater investment in false-negative sampling. A consensus emerged from intensive discussions that it was not justified on the basis of the incremental benefits that it might have yielded.

Consultations with the SAC failed to reveal any practicable alternative approach at the national level, and false-negative sampling was therefore restricted to the southern Provinces.

Pre-Surveyors

Experience over the first months of the fieldwork revealed that highly trained survey teams spent considerable amounts of time attempting to reach communities that proved to be inaccessible or not affected by landmines.

A small group of Pre-Surveyors was therefore recruited and trained. Using a specially designed questionnaire and traveling by motorcycle or utility vehicle, they visited communities in advance of the survey teams in order to ascertain their accessibility, to determine whether they were landmine-affected and, in the case of false-negative villages, to determine the required level of cascading.

INFORMATION MANAGEMENT SYSTEM FOR MINE ACTION DATABASE

Populating the IMSMA database did not pose any major challenges. The CIDC's survey instruments were, however, devised while the IMSMA database was itself still at the developmental stage. Despite regular communications between the CIDC and the SAC, there were minor differences between the structure of the VSQ and that of the IMSMA database, although certain problems were addressed in Version 1.2 of the IMSMA database. In order to reduce the danger of errors during data-entry and to compensate for the fact that coding sheets were not used, the CIDC translated the IMSMA database into Portuguese and adapted its structure to increase its correspondence with that of the VSQ, without, however, compromising the maintenance and integrity of the standardized set of data fields found in the IMSMA Field Module datapool in use by the IND. The temporary modifications made for the purposes of data-entry were removed when the CIDC's data were transferred to the National Demining Institute.

The CIDC devised several mechanisms to control logical and human errors during data entry, which quickly demonstrated their value. For example, unusually high numbers of victims or particularly large SMAs were flagged automatically and were then checked against the VSQ. A list of standardized codes for common strings of text that might have to be entered was also prepared. Consideration might be given to incorporating such mechanisms into future versions of the IMSMA database.

Especially in large countries where the national mine-action authority needs to maintain more than one office, it is essential that data added to the IMSMA database be made available very quickly and simply in all such offices. Transferring data from one datapool to another is complicated, especially to datapools that employ different survey identifiers or that do not use the same system of toponyms. It might be appropriate to devise mechanisms to facilitate the transfer of the IMSMA data between datapools.

Manipulating the IMSMA database requires a moderate level of familiarity with databases. In the context of Mozambique, skilled database analysts are not widely available, especially outside Maputo. The IMSMA database will have difficulty in achieving its full potential in

Mozambique unless analysts capable of generating syntheses of large volumes of data can be trained.

We understand that some of the deficiencies described above have been addressed in the IMSMA database Version 2, which was made available to the IND towards the end of the MLIS.

RECOMMENDATIONS

IN PLANNING THE LIS

1. The MLIS was conducted primarily for the Government of Mozambique, funded by the CIDA, and implemented by the CIDC in collaboration with the UNMAS and the SAC. To some degree, all LISs will serve a plurality of stakeholders. Given the reality that each stakeholder will have its own unique perspectives and priorities, there is a need, at the earliest stages of planning, to establish detailed common goals that are shared by all concerned. Accordingly, an effective mechanism is required to coordinate the participation of key stakeholders throughout the process, but especially in its early stages. That role could be played by a donor, the contractor, or representatives of the UNMAS or the SAC, but the QAM may be the most appropriate person to facilitate this process. Such a role would be consistent with the certification process, would help to avoid any potential differences that might not otherwise surface until a later date, and would not compromise the neutrality of the QAM.

2. LIS planners must be cognizant of the wide variations that exist among different landmine-affected countries in regard to: pre-existing mine-action planning and coordination capacity; numbers, types and distribution of landmine-affected communities; national and regional infrastructure; socio-economic characteristics; political, religious, cultural and security environments; and availability and adequacy of maps and national gazetteers. Variations in these key factors dictate a need for flexibility and creativity in planning and implementing strategies and methodologies that recognize and address the unique challenges, resources and circumstances encountered in each LIS, whilst simultaneously adhering to accepted standards. Leaving aside such unforeseeables as the widespread flooding in 2000 and 2001 and the inaccessibility of many more communities than anticipated, the need for such flexibility was illustrated by the requirement for the CIDC to compile a toponymy database, to prepare its own cartographic coverage, and to adapt the protocol for false-negative sampling to meet the specific environment in Mozambique. Attempts to apply rigid formulae will be counterproductive.

3. A comprehensive national gazetteer and national maps of suitable scale and accuracy are essential to the conduct of a LIS. Their existence (preferably digitized) and adequacy should be confirmed before decisions-in-principle are made about the feasibility of conducting a LIS, and must be factored into budget estimates and timetables.

4. The nature and quality of the expert opinion available and the locations where it might be accessed should be ascertained at a very early stage, together with an assessment of logistical and security challenges. In order to fully estimate accurate timelines and budgets there may be significant advantages to splitting the work of the LIS into separate phases. Although such an approach may involve greater effort and costs in the early stages of the LIS, especially in a country like Mozambique with a widely dispersed mine problem, it should improve the directed effort of community survey activities, thereby reducing overall time and costs and improving quality.

IN EXECUTING THE LIS

1. The practice of classifying communities as *Definitely Landmine-Free* ("DF") on the basis of expert opinion should be reconsidered, since it raises issues of potential liability for those making the classification. Communities or areas should be classified as DF only on the basis of a properly completed clearance certificate.

2. Based on the experience of the MLIS, provided that the timing of interventions is well chosen, the use of a part-time, as opposed to full-time, QAM is recommended. As indicated above, however, there may be merit in having the QAM involved in certain facets of the LIS from its earliest stages.

3. Conducting a LIS in a country with many languages poses special challenges, especially when many of those languages do not contain terms corresponding to those used in the research instruments. Every effort should be made to provide interpreters with training in the specialized vocabulary of the survey instruments. Survey personnel must exercise close supervision over their interpreters, but the importance of interpreters with proven abilities should be reflected in a relatively high status, and corresponding remuneration for such individuals within the team.

4. A relatively high level of investment in the selection, training and remuneration of staff at all levels within the organization is justified by the dividends paid in greater staff continuity, productivity, safety and quality at a lower long-term cost. Every effort must be made to ensure the continuity of senior staff, both national and international,

throughout the LIS, and to achieve a high degree of cohesion between the management of key functions, such as data-collection and data-processing and analysis.

5. The Mine Impact Score is a valuable tool, but its self-imposed generality and limited scope restrict its usefulness for some planners and mine-action agencies. By its emphasis on recent victims, the MIS assigns a very high percentage of landmine-affected communities to the low-impact category other than in exceptional circumstances. Planners in Mozambique expressed the need for indices that allow them to establish priorities among communities within the low-impact category. That need is particularly important if multi-year mine-action plans are to be formulated. The problems of a relatively small number of high- and medium-impact communities can usually be addressed in the early years of such a plan, which creates a need for an instrument to define priorities for its later years. The CIDC responded to that expressed need by devising several indices for the MLIS. Each LIS should be encouraged to develop indices that reflect the types and quality of data available in each country and that respond to national or regional circumstances and priorities. Any such indices should be conceptually clear and simple to calculate.

Information Management System for Mine Action Database

We recommend that consideration be given to the following:

- Incorporating mechanisms to control logical and human errors during data-entry; and
- Facilitating the rapid transfer of data between mine-action center datapools.

National Demining Institute

1. *Development of comprehensive national mine-action plan/program:* Based on the findings of the MLIS, and taking into account such other information, priorities and perspectives as are appropriate in the context of Mozambique, the IND should move quickly to develop a comprehensive national mine-action work plan that sets priorities for a period of perhaps 10 years. Key to the development of such a plan is a continued emphasis on national capacity-building in the areas of data-manipulation and analysis plus the effective utilization of complementary planning tools. The Technical Assistance Program funded by the CIDA through the UNDP is designed to assist in the development of indigenous capacity and the preparation of such a plan, but it is not a substitute for a national commitment to planning and action.

2. *Prioritization:* In developing its plans for future mine-action, the IND should explore the development of a wider range of impact indices and weightings of impact criteria.

3. *Dissemination of data:* It is apparent that the data collected and stored through the MLIS also have numerous potential applications in sectors outside mine-action. The IND should take steps to inform the wider government, NGO, commercial, and academic communities of the existence and relevance of those data and should encourage and facilitate broad access to them.

4. *Exchange of information within Mozambique's mine-action community:* The IND should establish the systems, means and resources to exchange data on a regular basis with all mine-action operators active throughout the country. Appropriate quality assurance measures and channels of communication should be implemented to control the entry and accuracy of data processed, and to ensure their transmission on a timely basis to planners and decision-makers.

5. *Extension of the MLIS:* The IND should evaluate the benefits of extending the MLIS to the areas and communities that were inaccessible to the CIDC, as and when they become accessible, using the same methodology as that employed by the CIDC. If it does so, the data collected should be entered into the IMSMA database.

6. *Research:* Recognizing that the objective of the MLIS was to identify the impacts of SMAs on communities, but not to evaluate in depth the significance of those impacts, the IND should encourage research projects designed to enhance the relevance and effectiveness of its own mine-action work plan. Experience in Mozambique and elsewhere has shown that local persons sometimes do not use formerly mined areas that were cleared for their benefit, because they are not convinced that it is safe to do so. The IND might encourage research and experiments into techniques for involving local persons in mine-clearance projects in their communities to ensure that the SMAs cleared are subsequently accepted and used by them.

DONORS, THE UNMAS AND THE SAC

For the implementation of future LISs, consideration should be given to the merits of appointing contractors on a basis that incorporates at least some of the following concepts:

1. An equitable system of pre-qualification based on transparent criteria of capacity and experience;
2. Appointing the QAM on or before the date of selection of the contractor, and mandating the QAM to ensure the satisfactory frequency and quality of communications among all parties, including the donor, the contractor, the national authority, the UNMAS, and the SAC;
3. Conducting pre-planning missions that involve, in some way, the participation of the QAM, the contractor, and the national mine-action authority;
4. Subdividing the LIS into a series of discrete stages, with the time and cost of each stage after the first one being one of the products of the preceding stage. Possible stages might be : expert opinion collection; pre-surveying; surveying; analysis and reporting;
5. Providing contingency (financial and time) for unforeseen events; and
6. Offering the national authority the opportunity to draw upon the knowledge gained by the contractor when preparing the national mine-action work plan.

CONCLUSION

The MLIS was an important undertaking that presented significant logistical and intellectual challenges for all concerned. Its successful completion could not have been achieved without the support and collaboration of countless Mozambican and international organizations and persons, the importance of whose individual and collective contributions we cannot adequately acknowledge. The CIDC is, however, particularly appreciative of the support that it received from the IND, the CIDA, the UNMAS and the SAC, and from the Mozambican mine-action community and the MLIS monitors. This combined effort has produced:

1. A database and reports that provide, for the first time, a nation-wide assessment of the community-level impacts of landmines in Mozambique in a format and to a standard established by the UNMAS;

2. An important tool for the development of a comprehensive national mine-action work plan by the IND;

3. Trained Mozambican personnel to enhance the management, efficacy and sustainability of future mine-action throughout the country;

4. Data for a National Gazetteer providing place names and coordinates for some 11,300 communities throughout Mozambique;

5. Information pertinent to broader development initiatives outside the mine-action realm.

It was fortunate that implementation of the MLIS took place during a time when the creation of the IND introduced significantly greater focus, dynamism and momentum to mine-action in Mozambique. The challenge for the IND now is to fully utilize the information generated by the MLIS to expedite preparation and execution of a national mine-action work plan.

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