Data Analysis

Scope and Nature of the Remaining Problem

This section describes the quantitative aspects of the remaining known challenge (as of 1st March 2018) for minefields (areas of ground containing mines laid with or without a pattern) and battlefields (Explosive Remnants of War Contaminated Areas) contamination as well as recorded PPIEDs.

1.1. Remaining Mine and ERW Contamination

There are 3,782 hazardous areas covering 1,764 sq. km of contaminated land in Afghanistan. This consists of 1,086[1] sq. km by abandoned improvised mines, ERWs, firing ranges and 678[2] sq. km by legacy contamination.

Out of 1,764 sq.km of contaminated areas, 864.2 sq. km is suspected hazardous areas (SHAs) which makes 49 percent of the whole contamination. During the year 1397, the programme will focus to analyse these areas in terms of accessibility and plan to convert these to confirmed hazardous areas (CHAs).

The tables below show a breakdown of known recorded contamination by type in terms of the number of minefields (MF) and battlefields (BF) as well as the size of contamination by region. These tables do not include the firing range contamination or new contamination which is not yet recorded in the mine action database. This shows that South region is the most contaminated and East region is the least contaminated.

TABLE 1- REMAINING RECORDED CONTAMINATION BY REGION, DEVICE TYPE AND AREA (SQ KM)

Region	Number of Contaminated Areas						Area in Sq. Km					
	AP	AV	ERW	BLU	AIM	Total	AP	AV	ERW	BLU	AIM	Total
Central	564	346	47	0	0	957				0.0	0.00	100.8
East	106	89	34	2	0	231				2.3	0.00	39.18
North	283	23	102	0	1	409				0.0	0.96	57.59
Northeas	694	18	48	9	7	776				2.6	0.14	71.63
South	127	276	33	0	46	482				0.0	19.1	237.5
Southeas	196	267	20	4	0	487				1.2	0.00	71.74
West	64	88	9	0	0	161				0.0	0.00	72.72
Total	**2,03**	**1,10**	**293**	**15**	**54**	**3,50**	**203**	**294**	**128**	**6**	**20**	**651**

TABLE 2 - SUMMARY OF IMPACTED COMMUNITIES BY RECORDED HAZARD TYPE

Hazard type	No. of contaminated areas	Area in sq. km	% area	Population Affected	% affected	No. of communities impacted	% of communities impacted
AP	2,034	202.71	31.13	789,901	33.83	847	55.22
AT	1,107	293.84	45.12	788,992	33.79	488	31.81

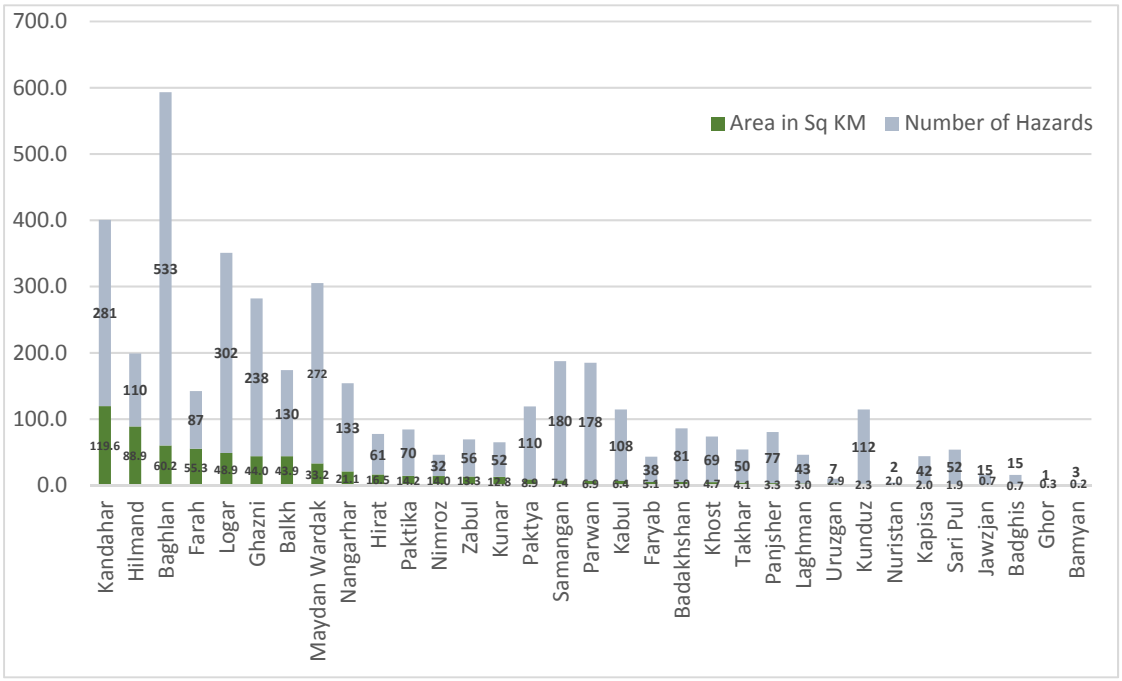
BLU	15	6.17	0.95	5,719	0.24	6	0.39
ERW	293	128.25	19.69	689,779	29.54	170	11.08
AIM[3]	54	20.22	3.10	60,774	2.60	23	1.50
Grand Total	**3,503**	**651.19**	**100**	**2,335,165**	**100**	**1,534**	**100**

Note that population figures presented in this data analysis are derived from 2010 LandScan data. LandScan uses light intensity at night to approximate the population 1000 m around a hazard area at a specific location. It is likely to underestimate the population figures, as many rural communities may not have electricity. The figures mentioned should therefore be viewed as the minimum number of people affected.

1.2. Number and size of contaminated areas by province

The below figure shows the number and size of contaminated areas by province sorted from smallest to largest. As shown below in terms of number of contaminated areasGhor province has the least, while Baghlan province has the most contaminated areas; however, in terms of area contamination, Bamyan has the smallest size while Kandahar has the largest contamination.

FIGURE 1- AREA IN SQ KM AND NUMBER OF **CONTAMINATED AREAS** BY PROVINCE



[3]The 20.2 sq. km out of 248.4 sq. km of AIM is recorded in IMSMA and the rest needs further confirmation prior entering to IMSMA.

FIGURE 2: REMAINING CONTAMINATION BY SHA/CHA AND DEVICE TYPE IN SQ KM

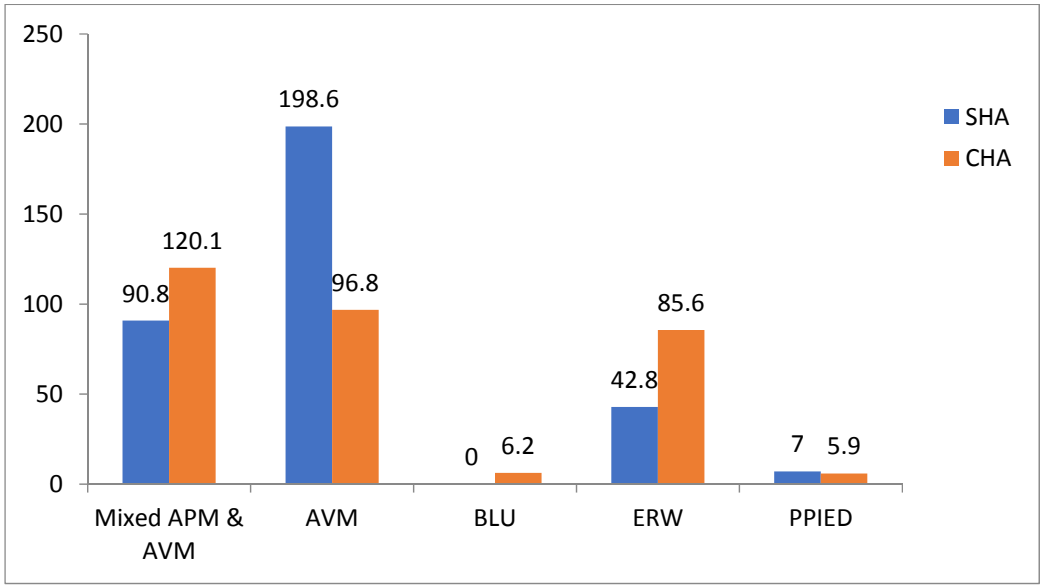


Table 5 shows the breakdown of known contamination type in terms of the number of minefields (MF) and battlefields (BF) as well as the area contaminated.

TABLE 5: REMAINING CONTAMINATION

Contamination type	No. of MF/BF	Area (sq km)	% area
APM	2,070	210.86	32.3
AVM	1,113	295.40	45.2
ERW	297	128.37	19.6
PPIED	45	12.97	2.0
BLU	15	6.17	0.9
Total	3,540	653.77	100

TABLE 6: REMAINING AP CONTAMINATION BY REGION AND AREA (SQ KM)

Region	Suspected Devices	Number of Hazards	% of Hazards	Area in SQ KM	% of Area	No. of communities impacted	% communities impacted
North East	AP	694	33.53	62.83	29.80	263	28.28
Central	AP	584	28.21	38.60	18.30	276	29.68
West	AP	67	3.24	34.00	16.12	42	4.52
South	AP	140	6.76	32.83	15.57	88	9.46
South East	AP	196	9.47	18.67	8.85	108	11.61
North	AP	285	13.77	14.82	7.03	116	12.47
East	AP	104	5.02	9.11	4.32	37	3.98
Grand Total		**2,070**	**100**	**210.86**	**100**	**930**	**100**

As was the case last year, most of the AP-contaminated areas and hazards are located in the North East region, followed by the Central region, while the Eastern region has the fewest AP hazards. The Central region also remains the most affected in terms of population. Contamination in the Central region accounts for nearly 29.68% of the total, second only to the North East region with 28.28%.

TABLE 7: REMAINING AT CONTAMINATION BY REGION IN ORDER OF AREA (SQ KM)

Region	Suspected Devices	Number of Hazards	% of Hazards	Area in SQ KM	% of Area	No. of communities impacted	% communities impacted
South	AT	277	24.89	161.05	54.52	129	24.62
Central	AT	349	31.36	51.07	17.29	127	24.24
South East	AT	267	23.99	41.46	14.04	161	30.73
West	AT	88	7.91	32.13	10.88	38	7.25
East	AT	91	8.18	8.70	2.95	37	7.06
North East	AT	18	1.62	0.53	0.18	14	2.67
North	AT	23	2.07	0.46	0.15	18	3.44
Grand Total		**1,113**	**100**	**295.4**	**100**	**524**	**100**

As shown in Table 7, the highest percentage of AVM contamination exists in the South region and the lowest percentage in the North region, while the South East region has the highest number of people

impacted by AT mines as well as the highest number of communities impacted. The North, North East and East regions are notably less affected by AT mines than other regions.

Table 8 describes the current state of ERW contamination throughout the regions. The North region shows the greatest contamination, with 102 hazards covering 42.72 square kilometres, while the Northeast region has the lowest level of contamination covering 4.26 square kilometres.

TABLE 8: REMAINING ERW CONTAMINATION BY REGION IN ORDER OF AREA (SQ KM)

Region	Suspected Devices	Number of Hazards	% of Hazards	Area in SQ KM	% of Area	No. of communities impacted	% communities impacted
North	ERW	106	35.69	42.72	33.28	23	13.5
South	ERW	32	10.77	33.04	25.74	28	16.4
East	ERW	33	11.11	18.77	14.62	18	10.5
Central	ERW	49	16.50	11.24	8.76	37	21.6
South East	ERW	20	6.73	10.53	8.21	14	8.2
West	ERW	9	3.03	6.59	5.13	9	5.3
North East	ERW	48	16.16	5.47	4.26	42	24.6
Grand Total		**297**	**100**	**128.36**	**100**	**171**	**100**

Table 8.1 describes the current state of PPIED contamination throughout the regions. The South region shows the greatest contamination, with 37 hazards covering 11.87 square kilometres, while the Northeast region has the lowest level of contamination covering 0.14 square kilometres.

TABLE 8.1: REMAINING PPIED CONTAMINATION BY REGION IN ORDER OF AREA (SQ KM)

Region	Suspected Devices	Number of Hazards	% of Hazards	Area in SQ KM	% of Area	No. of communities impacted	% communities impacted
South	PPIED	37	82.22	11.87	91.54	21	84
North	PPIED	1	2.22	0.96	7.38	1	4
North East	PPIED	7	15.56	0.14	1.09	3	12
Grand Total		**45**	**100**	**12.97**	**100**	**25**	**100**

Table 8.2 describes the current state of BLU contamination throughout the regions. The North East region shows the greatest contamination, with 9 hazards covering 2.63 square kilometres, while the Southeast region has the lowest level of contamination covering 1.20 square kilometres.

TABLE 8.2: REMAINING BLU CONTAMINATION BY REGION IN ORDER OF AREA (SQ KM)

Region	Suspected Devices	Number of Hazards	% of Hazards	Area in SQ KM	% of Area	No. of communities impacted	% communities impacted
North East	BLU	9	60.00	2.63	42.73	4	66.67
East	BLU	2	13.33	2.33	37.81	1	16.67
South East	BLU	4	26.67	1.20	19.46	1	16.67
Grand Total		**15**	**100**	**6.16**	**100**	**5**	**100**

As shown in Table 9 below, AP minefields directly impact 933 communities, AT minefields 524 communities, BLU 6, PPIED 25 and ERW-contaminated areas 171 communities. In total, 1,425 communities are directly impacted.[4]

TABLE 9: SUMMARY OF IMPACTED COMMUNITIES BY HAZARD TYPE

Hazard type	No. of hazards	Area SQ KM	% area	Population Affected[5]	% affected	No. of communities impacted	% communities impacted
AP	2,070	210.86	32.25	923,585	38.00	930	56.16
AT	1,113	295.40	45.18	754,176	31.03	524	31.64
ERW	297	128.37	19.64	692,193	28.48	171	10.33
BLU	15	6.17	0.94	5,466	0.22	6	0.36
PPIED	45	12.97	1.98	55,076	2.27	25	1.51
Grand Total	**3,540**	**653.77**	**100**	**2,430,496**	**100**	**1656**	**100**

However, the indirect impact of this contamination on other communities is considerable. Each minefield is linked to only one community. If a minefield is between communities, it does not only impact the nearest one but also neighbouring communities who are using the roads as well as the land for agriculture and grazing.

Contamination also impacts people travelling between non-contaminated communities when they pass through an impacted community. Furthermore, if development projects aimed to assist a group of impacted and non-impacted communities are hampered due to landmines, this has an impact on all nearby communities who might potentially benefit from a development project such as power lines or other types of infrastructure, and not just the contaminated community. Thus, in reality, the figure of

[4]Some communities are directly impacted by more than one type of contamination, thus the total of these figures (1,010, 508 and 170) total more than 1,688.

[5]The beneficiary calculation in IMSMA has changed from 500 m to 1 km as most of the hazards are currently in mountainous areas away from villages, but communities still need those areas for different purposes and may fall victim to mines/ERW.

1,425 impacted communities is lower than the actual number of communities affected by mines and ERW contamination in Afghanistan.

Note that population figures presented in this data analysis are derived from 2010 LandScan data. LandScan uses the light intensity at night to approximate the population at a specific location. It is likely to underestimate the population figures, as many rural communities may not have electricity. The figures mentioned should therefore be viewed as the minimum number of people affected.

It should be noted that, in places where there are adjacent minefields, the same population may be impacted by more than one hazard and consequently may be "double counted" in the following tables. It should also be noted that these population figures are substantially lower than those taken at the community level during the Afghanistan Landmine Impact Survey (ALIS). The decision to use LandScan data was based on the fact that LandScan data is quantitative, while ALIS is qualitative. ALIS dates back to 2004 whereas LandScan data was gathered in 2010.

As shown in Table 10 below, a total of 1,338 remaining hazards are located within one kilometre of community centres. These hazardous areas together contaminate a total of 274.30 square kilometres, of which 20.68% contain AP mines, 48.76% AT , 3.31% PPIED , 0.44% BLU and 26.81% ERW. The proximity of these hazardous areas to community centres means that they become major obstacles for community development, in addition to threatening the personal security of local inhabitants. As can be seen in the table below, 14.05% of hazardous areas located close to community centres are in the South region, 34.16% are in the Central region and 21.60% are in the South East region. The numbers of hazardous areas located close to community centres are relatively few in the remaining regions. Proximity is considered a factor in the ranking system to classify hazards as very high, high, medium or low impact. Accordingly, many of the high priority hazards will be cleared during the early years of the extension request plan.

TABLE 10: HAZARDS LOCATED WITHIN 1 KM OF A COMMUNITY CENTRE

Region	Suspected Devices	Number of Hazards	Remaining Area SqM
Central	AP	221	18,763,101
Central	AT	200	28,758,319
Central	ERW	36	9,520,021
Sub Total		**457**	**57,041,441**
East	AP	34	4,715,384
East	AT	46	4,256,437
East	ERW	16	10,393,354
Sub Total		**96**	**19,365,175**
North	AP	54	3,040,427
North	AT	8	158,577
North	ERW	37	17,449,890
Sub Total		**99**	**20,648,894**
North East	AP	139	6,047,764
North East	AT	2	14,309
North East	ERW	32	3,845,007

North East	PPIED	1	22,952
Sub Total		**174**	**9,930,032**
South	AP	74	14,275,796
South	AT	72	68,700,823
South	ERW	17	22,623,409
South	PPIED	25	9,063,796
Sub Total		**188**	**114,663,824**
South East	AP	84	7,193,049
South East	AT	190	29,791,460
South East	BLU	4	1,200,000
South East	ERW	11	8,089,972
Sub Total		**289**	**46,274,481**
West	AP	14	2,700,267
West	AT	16	2,065,994
West	ERW	5	1,605,525
Sub Total		**35**	**6,371,786**
Grand Total		**1,338**	**274,295,633**

Figure 3 shows how the number of hazards is distributed across districts; there are 102 districts with between one and five hazards, 86 districts with between six and 20 hazards, 24 districts with between 21 and 40 hazards and 25 districts with 41 or more hazards. In 188 districts, which account for 79.32% of the total 237 impacted districts, contamination is relatively low (20 hazards or less per district). The data also show that 25 districts are densely contaminated, with more than 40 hazards each.

FIGURE 3: DISTRIBUTION OF HAZARDS ACROSS DISTRICTS

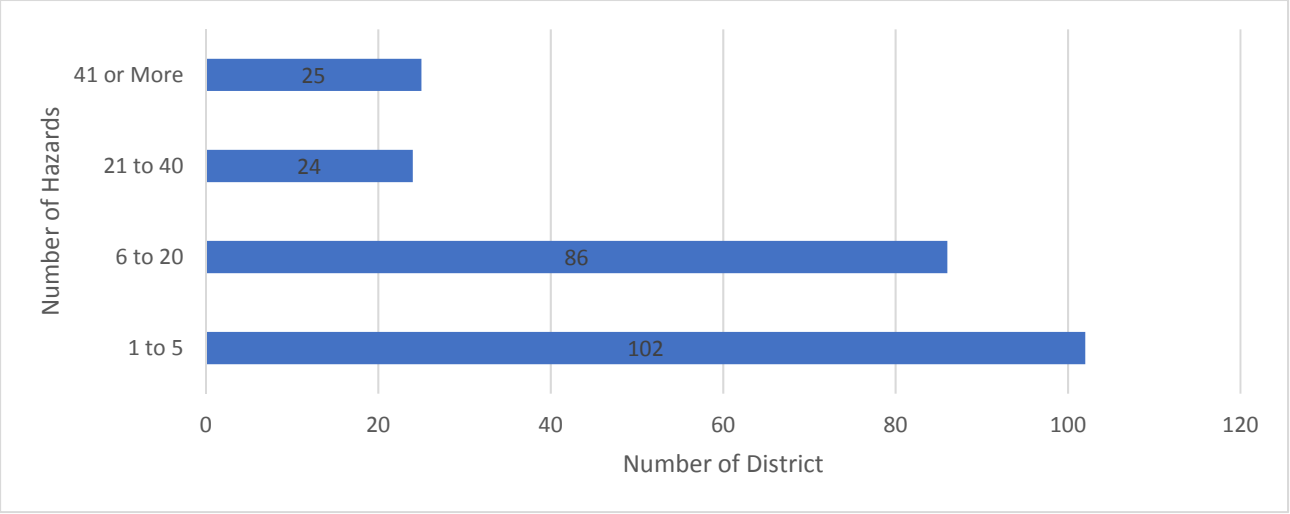


Figure 4 below shows the number of hazards in each province. As can be seen, Baghlan Province in the North East is the most contaminated in terms of number of hazards with 533 hazards, accounting for 15.06% of all of Afghanistan's hazards (9.21% of the total area contaminated), while as shown in Figure 5,

Kandahar has the largest area of contamination at 119.58 square kilometres (18.29% of the total area contaminated).

1.1.1. Analysis by Device Type

Table 11 below breaks down the remaining contamination by device type and shows that the plurality(46.8%) of the remaining contaminated areas contain AT mines, while the AP mines and abandoned IEDs (AIED), considered to be part of the Article 5 challenge, cover 38 % of the remaining contamination, and ERW 15.1 %.

TABLE 11: REMAINING CONTAMINATION BY DEVICE TYPE

Suspected Devices	Number of Hazards	% of Total Hazards	Remaining Area SqM	% of Total Area	Population	% of Total Population
PPIED	45	1.27	12,971,563	1.98	60,281	2.42
AP	1,775	50.14	140,601,144	21.51	748,308	29.99
Sub Total	**1,820**	**51.41**	**153,572,707.13**	**23.49**	**808,589.00**	**32.41**
APAIEDERW	3	0.08	475,521	0.07	227	0.01
APAT	159	4.49	42,102,900	6.44	108,428	4.35
APATERW	18	0.51	12,597,690	1.93	10,500	0.42
APERW	105	2.97	8,313,913	1.27	77,706	3.11
APPPIEDERW	5	0.14	1,259,858	0.19	510	0.02
ATAIED	4	0.11	5,015,735	0.77	1,333	0.05
ATAIEDERW	1	0.03	495,930	0.08	885	0.04
Sub Total	**295**	**8.33**	**70,261,547.00**	**10.75**	**199,589.00**	**8.00**
AT	1,071	30.25	291,629,489	44.61	740,173	29.67
ATERW	42	1.19	3,768,106	0.58	44,666	1.79
Sub Total	**1,113**	**31.44**	**295,397,594.67**	**45.18**	**784,839.00**	**31.46**
ERW	297	8.39	128,366,757	19.64	696,137	27.90
ERWBLU	14	0.40	5,980,062	0.91	5,466	0.22
Sub Total	**311**	**8.79**	**134,346,818.70**	**20.55**	**701,603.00**	**28.12**
BLU	1	0.03	186,004	0.03	253	0.01
Sub Total	**1**	**0.03**	**186,004**	**0.03**	**253**	**0.01**
Grand Total	**3,540**	**100**	**653,764,671**	**100**	**2,494,873**	**100.00**

It should also be noted that, among the 311 ERW-contaminated hazards, there are 14 hazards that are contaminated by cluster munitions, covering 5.98 square kilometres.

As shown in Table 12, a total of 162 hazards, each covering less than 1,000 square metres and thus defined as small hazards, are among the remaining contaminated sites.

TABLE 12: REGIONAL DISTRIBUTION OF REMAINING MINE/ERW CONTAMINATION

Region	Suspected Devices	Number of Hazards	Remaining Area SQ KM
Central	AP	28	7,402
Central	AT	4	2,668
Central	ERW	16	2,318
Sub Total		**48**	**12,388**
East	AP	3	100
East	AT	2	440
East	ERW	4	394
Sub Total		**9**	**934**
North	AP	7	3,556
North	ERW	8	346
Sub Total		**15**	**3,902**
North East	AP	34	15,945
North East	AT	2	918
North East	ERW	17	801
Sub Total		**53**	**17,664**
South	AP	1	800
South	AT	5	491
South	ERW	3	1,177
Sub Total		**13**	**2,468**
South East	AP	4	1,928
South East	AT	4	804
South East	ERW	8	979
Sub Total		**16**	**3,711**
West	AP	3	600
West	AT	2	939
West	ERW	3	150
Sub Total		**8**	**1,689**
Grand Total		**162**	**42,755**

59 of these sites (or 36.42% of the total) are contaminated by ERW. If these small hazards are cleared, there will be a 12% reduction in the remaining small hazards landmine and ERW contamination. However, it will not bring a considerable change to the total size of contamination in proportion to the hazard number. The number of open tasks will reduce significantly but the clearance of these small tasks will not reduce overall contamination by the same proportion. As shown, most of the small hazards are located in the North East, Central and North regions of the country.

Size is one of the factors in the impact classification system, with smaller areas likely to be prioritised. As a result, many of these small hazards will be cleared over the next few years.

The slope of the land on which hazards are located provides a guide for planning. The slope values for the hazards are derived using a3D terrain model and Arc GIS spatial analysis. Table 13 shows how the remaining hazards are broken down based on slope.

TABLE 13: SLOPE OF REMAINING CONTAMINATION

Slope	Population	%Population	Number of Hazards	%Hazards	Remaining Area SqM	%Remaining Area
0-5%	1,316,633	52.77	1,027	29.01	359,553,538	55.00
05-10%	388,026	15.55	542	15.31	92,988,129	14.22
10-15%	242,663	9.73	343	9.69	35,722,380	5.46
15-20%	139,509	5.59	247	6.98	22,064,032	3.37
20-25%	85,924	3.44	223	6.30	21,099,709	3.23
25-30%	62,327	2.50	189	5.34	13,041,913	1.99
More than 30%	259,791	10.41	969	27.37	109,294,970	16.72
Total	**2,494,873**	**100**	**3,540**	**100**	**653,764,671**	**100**

Most of the remaining areas have a slope of 0 to 5%; 55.00% have slopes of between 0% and 5% and 18.71% have a slope greater than 25%. The increased area size of hazards with a higher slope can affect the ability of mine action implementers to use machines or dogs, and the speed of mine clearance is likely to be slower on hazards with a higher slope.

TABLE 14: SLOPE OF REMAINING AP CONTAMINATION

Slope	Population	%Population	Number of Hazards	% Hazards	Remaining Area SqM	%Remaining Area
0-5%	297,620	31.40	260	12.56	45,127,189	21.40
05-10%	97,260	10.26	152	7.34	22,964,530	10.89
10-15%	110,787	11.69	187	9.03	14,698,496	6.97
15-20%	107,196	11.31	198	9.57	12,505,014	5.93
20-25%	65,646	6.93	193	9.32	13,814,623	6.55
25-30%	53,616	5.66	171	8.26	10,968,421	5.20
More than 30%	215,772	22.76	909	43.91	90,784,418	43.05
Total	**947,897**	**100**	**2070**	**100**	**210,862,691**	**100**

Table 14 above shows over 1,471 AP hazards (71.06% of the AP contaminated area) are on land with a slope higher than or equal to 20%, indicating that most AP contaminated areas will need to be addressed manually.

As shown in Table 15, over 95.84% of the areas that contain AT mines are located on relatively flat ground (slopes of 15% or less). Experience in recent years and the improvement in demining technology show that some specific demining machines such as front-end loaders with rippers and rotary mine combs are very effective and achieve a higher productivity rate. However, front-end loaders with a gill bucket and manual teams equipped with mine-lab detectors, Ground Penetrating Radar (GPR) or Handheld Standoff Mine Detection System (HSTAMIDS) are also effective; but considering their productivity rates, they do not constitute an efficient response to dealing with large-scale AT contamination in Afghanistan. DMAC

is in contact with the Geneva International Centre for Humanitarian Demining (GICHD) to seek and implement trials clearing big AVM areas to find the most appropriate methodology and tools/equipment for efficient and effective clearance of the areas.

Table 15: Slope of Remaining AT Contamination

Slope	Population	%Population	Number of Hazards	% Hazards	Remaining Area SqM	%Remaining Area
0-5%	377,054	48.04	557	50.04	213,044,823	72.12
05-10%	247,802	31.57	343	30.82	56,108,064	18.99
10-15%	107,780	13.73	126	11.32	13,952,801	4.72
15-20%	30,256	3.86	42	3.77	8,325,682	2.82
20-25%	11,590	1.48	16	1.44	1,527,749	0.52
25-30%	7,171	0.91	10	0.90	442,397	0.15
More than 30%	3,186	0.41	19	1.71	1,996,079	0.68
Total	**301,144**	**100**	**1,145**	**100**	**277,157,693**	**100**

Table 16 shows that more than 82.96% of ERW-contaminated areas are on relatively flat ground (slopes of 15% or less).

TABLE 36: SLOPE OF REMAINING ERW CONTAMINATION

Slope	Population	%Population	Number of Hazards	% Hazards	Remaining Area SqM	%Remaining Area
0-5%	641,959	84.23	210	58.82	101,381,526	68.73
05-10%	42,964	5.64	47	13.17	13,915,536	9.43
10-15%	24,096	3.16	30	8.40	7,071,083	4.79
15-20%	2,057	0.27	7	1.96	1,233,336	0.84
20-25%	8,688	1.14	14	3.92	5,757,337	3.90
25-30%	1,540	0.20	8	2.24	1,631,095	1.11
More than 30%	40,833	5.36	41	11.48	16,514,473	11.20
Total	**762,137**	**100**	**357**	**100**	**147,504,386**	**100**

Data records from Moderate Resolution Imaging Spectra radiometer (MODIS) snow-covered satellite data[6] shows the "high points" for snow every month of the year. Using the 2013snow high points, to some extent it can be predicted how many hazards will be "covered" with snow during the peak winter months in Afghanistan. Table 19 shows that 62.61% of the areas affected by AP landmines will not be covered or did not record any snow during the peak winter months, indicating mine clearance operations can

[6]This data is collected under a project by Information Technology for Humanitarian Assistance, Cooperation and Action ITHACA), http://www.ithacaweb.org/projects/snowcover/

continue throughout the year. Mine clearance in the remaining 37.39% of AP hazards is likely to be affected by snow. This should be factored into the project design for clearing AP contaminated areas. 71.26% of the areas affected by AT landmines will not be covered or did not record any snow during the peak winter months. Mine clearance in the remaining 28.74% of AT hazards is likely to be affected by snow. Almost 83.27% of ERW contaminated areas are not covered with snow.

TABLE 17: REMAINING CONTAMINATION BY SNOW COVERAGE

Suspected Devices	Snow	Number of Hazard	% of Hazards	Remaining Area SqM	% of Area
AP	No snow	1,188	57.39	132,022,953	62.61
AP	Coverage with snow	882	42.61	78,839,738	37.39
Total		**2,070**	**100**	**210,862,691**	**100**
AT	No snow	560	50.31	210,485,771	71.26
AT	Coverage with snow	553	49.69	84,911,824	28.74
Total		**1,113**	**100**	**295,397,595**	**100**
ERW	No snow	217	73.06	106,884,590	83.27
ERW	Coverage with snow	80	26.94	21,482,167	16.73
Total		**297**	**100**	**128,366,757**	**100**
PPIED	No snow	45	100.00	12,971,563	100.00
Total		**45**	**100**	**12,971,563**	**100**
BLU	No snow	15	100.00	6,166,066	100.00
Total		**15**	**100**	**6,166,066**	**100**
Grand Total		**3,540**	**100**	**591,687,005**	**100**