THE HUMANITARIAN AND DEVELOPMENTAL IMPACT OF ANTI-VEHICLE MINES

GLOBAL MAPPING AND ANALYSIS OF ANTI-VEHICLE MINE INCIDENTS IN 2017

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KEY FINDINGS

169 incidents

↘ 7%
decrease
compared with 2016

related,
or suspected
to be related,
to AVMs in

24 states and territories

487 casualties

↗ 15%
increase
compared with 2016

321 were injured

166 were killed

On average

2.9 casualties per incident

51% of casualties were civilians

- In 2017, the GICHD and SIPRI recorded 169 incidents related, or suspected to be related, to anti-vehicle mines (AVMs)[1] in 24 states and territories, a decrease of 7 per cent compared with 2016. A total of 487 casualties[2] including 321 injured and 166 killed were recorded from these incidents, an increase of 15 per cent in comparison with 2016.
- Ukraine, Pakistan, Mali and Iran were the four states with the most recorded AVM incidents in 2017, followed by Chad, Syria, *Western Sahara* and Yemen. Since 2015, Ukraine has been the state with most recorded incidents for three consecutive years, and Mali has continuously featured among the top three affected states.
- Pakistan, Ukraine, Mali, Chad and Yemen were the states with the highest number of casualties in 2017. The highest number was recorded in Pakistan with 135 casualties which accounts for 28 per cent of the global total.
- In 2017, AVM incidents were most lethal when they involved a civilian vehicle. The lethality ratio, the ratio of those killed to overall casualties, of incidents involving civilian vehicles reached 40 per cent, while the ratio with overall non-civilian vehicles amounted to 23 per cent.

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- "Dales voz a las víctimas" platform
- Deminers Concept Nigeria Limited
- Fondation Suisse de Déminage
- Landmine Monitor
- Mines Advisory Group
- Norwegian People's Aid
- Organization for Security and Co-operation in Europe Special Monitoring Mission to Ukraine
- Peace Sharing Association/Korean Campaign to Ban Landmines
- Sustainable Peace and Development Organization, Pakistan
- Syrian Network for Human Rights
- The HALO Trust
- Albanian Mines and Munitions Coordination Office
- Azerbaijan National Agency for Mine Action
- Bosnia and Herzegovina Mine Action Center
- Cambodian Mine Action and Victim Assistance Authority
- Center for Humanitarian Demining and Expertise, Armenia
- Centre National d'Action Antimines au Sénégal
- Centro Peruano de Acción contra las Minas Antipersonal
- Comisión Nacional de Desminado Humanitario, Chile
- Croatian Mine Action Centre
- Direction de l'Action Humanitaire contre les Mines et Engins non explosés, Burundi
- Directorate of Mine Action Coordination, Afghanistan
- Haut Commissariat National de Déminage, Chad
- Instituto Nacional de Desminagem, Mozambique
- Iraqi Kurdistan Mine Action Agency
- Israeli National Mine Action Authority
- Kosovo Mine Action Centre
- Lebanon Mine Action Center
- Ministère de la Défense du Burkina Faso
- Ministère de la Défense du Cameroun
- Palestine Mine Action Centre
- Programme national de déminage humanitaire pour le développement, Mauritania
- South Sudan National Mine Action Authority
- STC Delta, Georgia
- Sudan National Mine Action Center
- Thailand Mine Action Center
- The National Committee for Demining and Rehabilitation, Jordan
- Yemen Executive Mine Action Center
- Zimbabwe Mine Action Centre

BACKGROUND

PURPOSE AND OBJECTIVES

The need for systematic data collection on AVM incidents was first recognised by the GICHD and SIPRI in a joint study on the humanitarian and developmental impact of anti-vehicle mines published in October 2014.[3] Since 2015, the two organisations have been collecting global data on AVM incidents with the aim of improving evidence and identifying trends on the direct humanitarian impact of AVMs. Detailed and geo-referenced data for each incident are available on interactive and regularly updated online maps.[4]

This report summarises data and analyses of AVM incidents in 2017. It follows up on similar reports published by the GICHD and SIPRI examining AVM incidents in 2015 and 2016.[5] This collection of data over three consecutive years allows for an initial comparative analysis on and trends of the humanitarian impact of AVMs.

RESEARCH METHODOLOGY

This document draws on field reports provided by states, mainly national mine action authorities/centres, as well as mine action and other humanitarian organisations. Media reviews were conducted in Arabic, English, French, Portuguese, Russian, Spanish, Ukrainian and Urdu to complement the field reports.

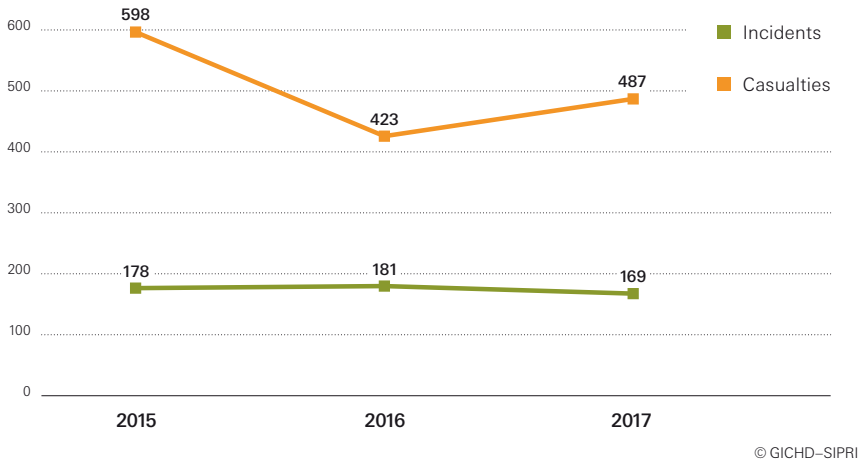
FIGURE 1 SOURCES OF INCIDENTS[6]

In 2017, 119 out of 169 recorded incidents (70 per cent) were reported by 45 mine action programmes and organisations; 50 incidents were recorded from media sources. Compared with 2015 and 2016, when field reports represented 53 per cent and 44 per cent of the sample respectively, the stronger reliance on field reports in 2017 suggests a higher level of data accuracy. A more detailed description of the methodology and challenges of this research is available in Annex 1.

GLOBAL TRENDS IN 2017

In 2017, the GICHD and SIPRI recorded 169 incidents that were related, or suspected to be related, to AVMs in 24 states and territories.[7] This indicates a slight decrease in the number of incidents in comparison with both 2015 and 2016, although the scale has remained fairly stable across the three years (see Figure 2).

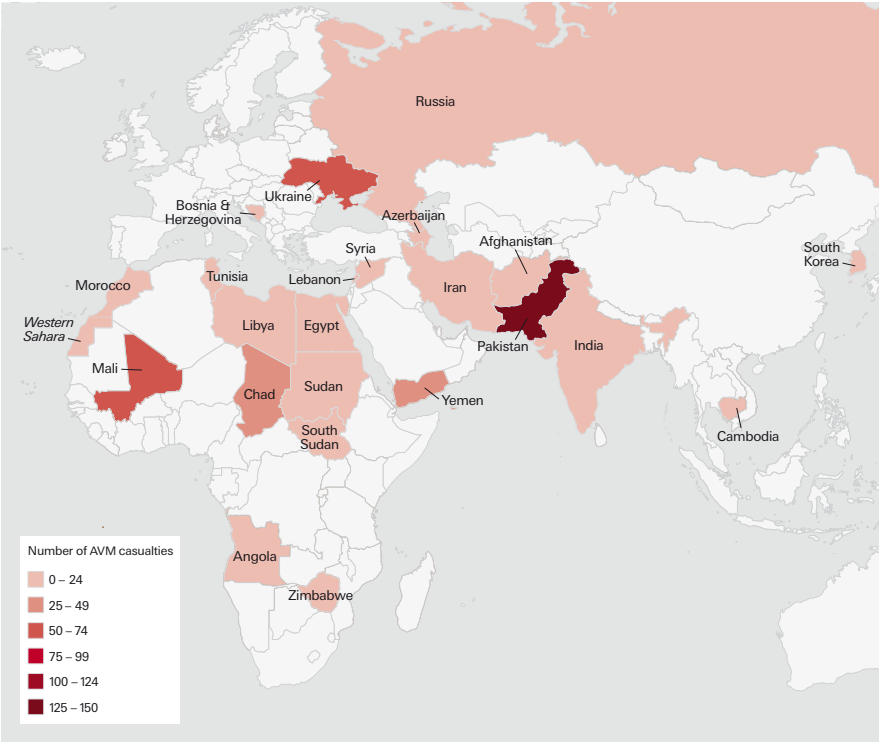
FIGURE 2 NUMBER OF INCIDENTS AND CASUALTIES, 2015–2017



Among all countries where incidents were recorded, the highest number of incidents in 2017 were found in Ukraine, Pakistan, Mali and Iran. As in 2015 and 2016, Ukraine was the state where most incidents were recorded with, however, the same number of incidents as Pakistan in 2017 (31 incidents each).[8] In 2017, Russia, Zimbabwe and Bosnia and Herzegovina suffered AVM incidents for the first time since GICHD–SIPRI data collection began. Prior to this, they had recorded their last AVM incidents in 2009, 2013 and 2014, respectively.[9]

A total of 487 AVM casualties were recorded in 2017, including 321 injured and 166 killed. This represents an increase of 15 per cent against 2016 figures.[10] Pakistan suffered the highest numbers of casualties (135), which accounts for 28 per cent of the global total—a notable increase compared with the previous year.[11] While this spike may be partly explained by strengthened data collection, it is worth noting that a single incident in 2017 resulted in 27 casualties, after a civilian vehicle drove over a suspected AVM. This incident resulted in the highest recorded number of casualties globally that year.[12]

FIGURE 3 HEAT MAP OF ALL STATES AND TERRITORIES WITH RECORDED INCIDENTS IN 2017



Absolute numbers of casualties are: Pakistan 135, Ukraine 74, Mali 62, Chad 47, Yemen 42, India 24, Afghanistan 21, Syria 18, Iran 12, *Western Sahara* 12, Sudan 11, Azerbaijan 10, Egypt 4, Lebanon 4, Angola 3, Cambodia 3, Bosnia and Herzegovina 1, Morocco 1, Russia 1, South Korea 1, Zimbabwe 1, Libya 0, South Sudan 0, Tunisia 0

Initial analysis suggests that the states/territories with higher numbers of AVM casualties in 2017 tend to have had their last conflict more recently—or may still be in active conflict.[13] At the same time, the long-term impact of AVM contamination is clearly observable with a number of states/territories still suffering from AVM casualties today, despite the conclusion of their last conflict dating back years or decades.

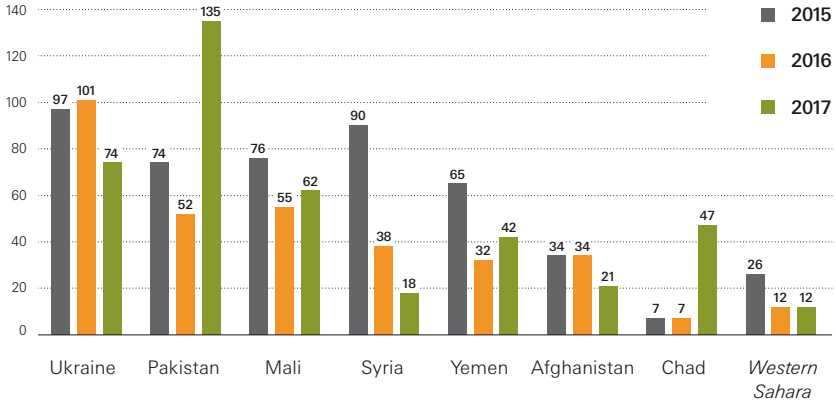
Between 2015 and 2017, the GICHD and SIPRI recorded 528 AVM incidents that caused 1,508 casualties. This indicates that 503 people have been killed or injured from 176 incidents on average every year. This is significantly higher than the average of 250 AVM casualties from 2012 to 2014 (reported by the Landmine Monitor).[14] The highest numbers of casualties recorded by the GICHD and SIPRI between 2015 and 2017 occurred in Ukraine, Pakistan, Mali, Syria and Yemen (see Table 1). These states alone account for two-thirds of the global three-year total.

TABLE 1 STATES/TERRITORIES WITH HIGHEST NUMBERS OF CASUALTIES, 2015–2017

State/ territory	Number of casualties 2015	Number of casualties 2016	Number of casualties 2017	Total number of casualties 2015–2017	Per cent of global casualties 2015–2017
Ukraine	97	101	74	272	18%
Pakistan	74	52	135	261	17%
Mali	76	55	62	193	13%
Syria	90	38	18	146	10%
Yemen	65	32	42	139	9%
Afghanistan	34	34	21	89	6%
Chad	7	7	47	61	4%
Western Sahara	26	12	12	50	3%

Figure 4 visually depicts the three-year casualty trends by state/territory among those with the highest number of total casualties during this period. The downward curve observed in Syria is in stark contrast to the spikes observed in Pakistan and Chad. Conversely, recorded AVM casualties in Cambodia decreased from 17 in 2015 to 3 in 2017. This trend follows, albeit slightly delayed, the steady decline in overall mine/explosive remnants of war (ERW) casualties over the last years: between 2016 and 2017 alone, the latter dropped by 30 per cent after a 25 per cent decrease the year before.[15] As a result, Cambodia no longer features among the eight states/territories with the highest, three-year AVM casualty numbers.

FIGURE 4 CASUALTY TRENDS IN STATES/TERRITORIES WITH HIGHEST NUMBERS OF CASUALTIES, 2015–2017

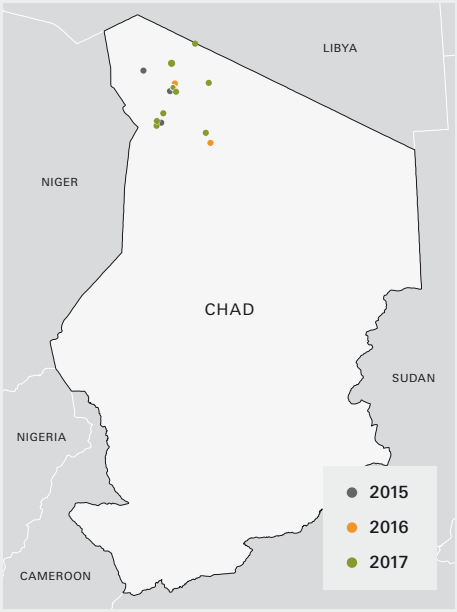


BOX 1 CASE STUDY CHAD

Mine and ERW contamination in Chad is essentially the result of the 1973 Libyan occupation of the Aozou Strip in the north of the country until its ultimate withdrawal in 1994, as well as of internal conflict.[16] Amidst this decades-long conflict, Libyan forces placed large quantities of both anti-personnel mines (APMs) and AVMs.

The contamination by AVMs still needs to be surveyed further in many areas of the country, particularly in Borkou, Ennedi, Moyen-Chari and Tibesti[17] regions. According to records of the National High Commission for Demining (HCND) in 2014, the Tibesti region accounted for about 64 per cent of Chad's 103 km² of confirmed mined area.[18] AVM contamination is particularly high in the north of the country. Clearance operations in the Zouar area in Tibesti region in 2015, for instance, resulted in almost 1,000 mines being found, 90 per cent of which were AVMs.[19] GICHD–SIPRI data corroborate this finding: all of the AVM incidents recorded from 2015 to 2017, 14 in total, occurred in Tibesti region (see Figure 5).

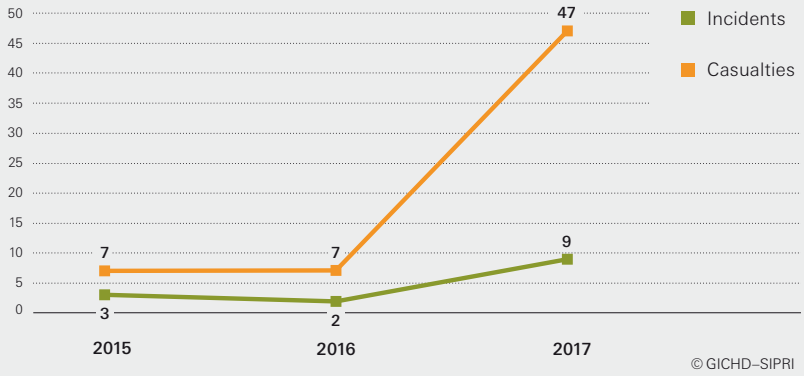
FIGURE 5 MAP OF INCIDENTS IN CHAD[20]



National data collection in Chad has traditionally been challenging and casualty reporting marked by yearly fluctuations.[21] This notwithstanding, GICHD–SIPRI data indicate that AVM casualties significantly spiked in 2017 (see Figure 6) as well as there being a strong prevalence of AVM compared with overall mine casualties. For instance, while HCND recorded 50 casualties in 2017 from mines overall, 47 resulted from AVMs alone.[22]

To contextualise the sharp increase in AVM casualties, HCND noted an "increase of 'gold dust finder[s]' (or gold panner[s]) in the north and an increase of Libyan cross-border traffic."[23] Gold miners represented nearly two-thirds of the total

FIGURE 6 INCIDENTS AND CASUALTIES IN CHAD, 2015–2017



casualties, which is a notable increase from previous years. Incidents related to people prospecting for gold are characterised by a particularly high casualty number (e.g. 15 in 2017) due to the fact that prospectors usually travel in teams of 10–20 workers per vehicle.[24] Not surprisingly, civilians accounted for the overwhelming majority of casualties in Chad (see Table 2).

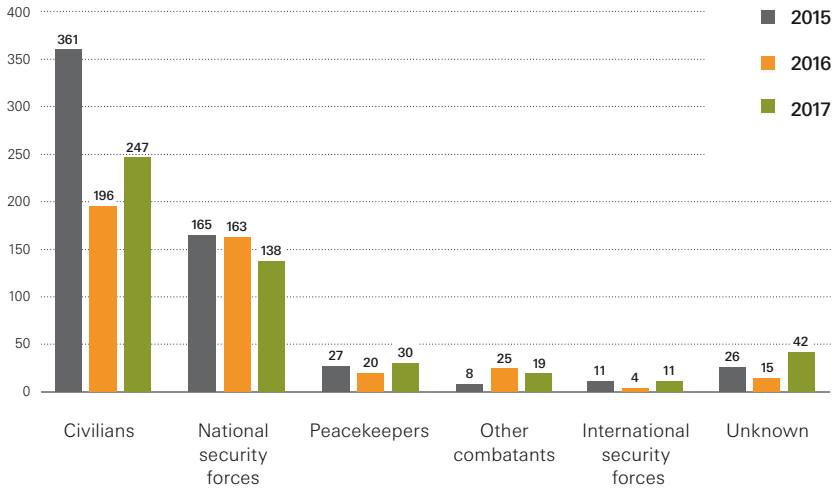
Still amongst the poorest areas of the country, the Tibesti region witnessed a hectic gold rush from 2013–2015 with an influx of unofficial gold miners from various Chadian ethnic groups and other countries. This eventually resulted in heightened competition over the region's scarce resources, environmental deterioration and armed clashes between local communities and the miners, coupled with a reinforcement of security forces. Chad prohibited gold mining activities at the end of 2013. Whilst the rush lost much of its momentum, gold miners began to return to the north of the country by mid-2016.[25]

The high numbers of casualties testify to the considerable human security risk of mine contamination to civilian communities. In a recent report, the Small Arms Survey and Conflict Armament Research also point to the need for mine clearance in northern Chad for regional security, as minefields "can serve as storehouses for mines and explosives that can be used on other battlefields. […] Between 2005 and 2010 mines dug up in Tibesti were exported to Libya and even more so to Niger [...]."[26]

CATEGORIES OF CASUALTIES

From 2015 to 2017, 56 per cent of casualties on average were civilians where disaggregated data were available (see Figure 7). Among the 44 per cent of non-civilian casualties, national security forces[27] alone accounted for the majority.

FIGURE 7 CATEGORIES OF CASUALTIES, 2015–2017[28]



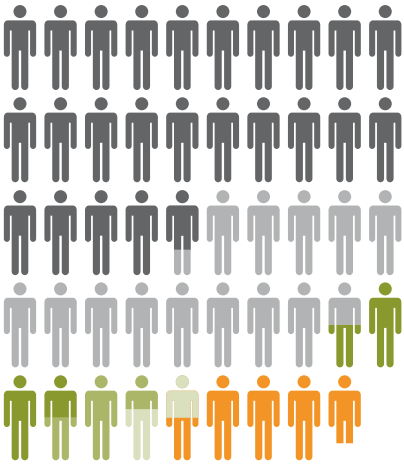
Casualty demographics, 2015–2017

56%
Civilian

44%
Non-civilian

Figure 8 shows a breakdown of casualties for 2017 alone. That year, the majority (247 out of 487) of recorded casualties were civilians (including humanitarian personnel)—which marks a proportional increase compared with the previous year (46 per cent in 2016)—followed by national security forces (138 out of 487). Other categories of casualties made up for smaller proportions of this breakdown.[29]

FIGURE 8 CATEGORIES OF CASUALTIES IN 2017



= 10 people

51% Civilians

28% National security forces

6% Peacekeepers

4% Other combatants

2% International security forces

9% Unknown

Absolute numbers are: civilians 247 (incl. 8 humanitarian personnel), national security forces 138, peacekeepers 30, other combatants 19, international security forces 11, unknown 42

CASUALTIES BY SEX AND AGE

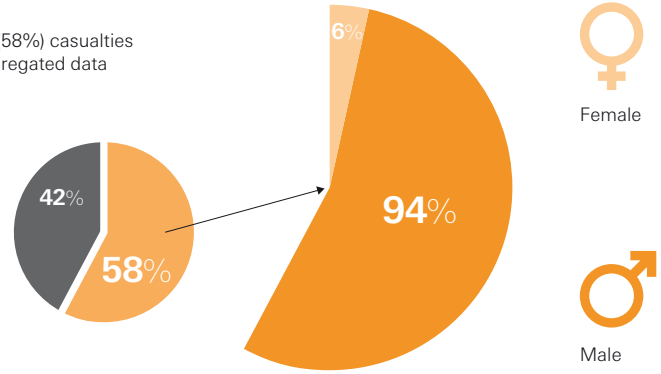
In 2017, sex-disaggregated data were available for 58 per cent of reported AVM casualties (283 casualties). This is higher than in either 2015 or 2016, possibly due to an increase in more detailed field reports, as opposed to data from the media. In 2017, following a pattern observed in previous years, in cases where disaggregated data were available, nearly all casualties were male. By contrast, women and girls only accounted for 6 per cent (see Figure 9). Apart from one peacekeeper in Ukraine, female casualties were exclusively civilian.[30]

Age-disaggregated information was available in 43 per cent of recorded casualties (210 casualties). 92 per cent of casualties where age was known were adults, whereas children made up 8 per cent (see Figure 9).[31] These figures corroborate trends noted in previous years.

FIGURE 9 CASUALTIES BY SEX AND AGE IN 2017

Sex disaggregation

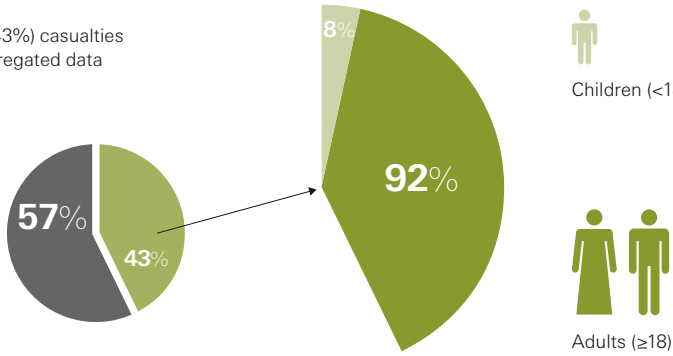
283 out of 487 (58%) casualties with sex-disaggregated data



Absolute numbers are: male 265, female 18

Age disaggregation

210 out of 487 (43%) casualties with age-disaggregated data

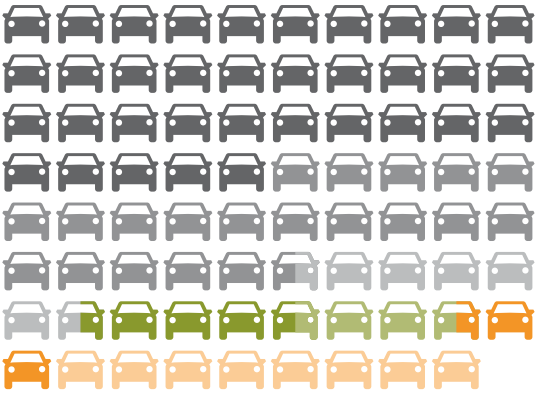


Absolute numbers are: adults 194, children 16

CATEGORIES OF VEHICLES

Analysing the proportion of incidents triggered by various categories of vehicles, results show that civilian vehicles and those of national security forces were the categories most impacted in 2017 (see Figure 10), in line with the trends of previous years.

FIGURE 10 CATEGORIES OF VEHICLES IN 2017



= 2 vehicles

- **44%** Civilian (excl. humanitarian)
- **26%** National security forces
- **8%** Peacekeeping
- **5%** Other combatants
- **4%** International security forces
- **3%** Humanitarian
- **10%** Unknown

Absolute numbers are: civilian 70, national security forces 41, peacekeeping 12, other combatants 8, international security forces 6, humanitarian 5, unknown 16

Breakdown of the civilian vehicle sub-categories (70 incidents in total)[32]

- Agricultural
- Commercial
- Other civilian

Absolute numbers are: agricultural 18, commercial 13, other civilian 39

A civilian vehicle (agricultural, commercial and other civilian) triggered AVMs in 44 per cent (70 incidents) of recorded incidents involving a vehicle (158 incidents), as opposed to 49 per cent in 2016 (84 incidents). Among civilian vehicles, a proportional shift can be noted from agricultural (39 per cent among civilian vehicles in 2016 to 26 per cent in 2017) to commercial vehicles (10 per cent in 2016 to 18 per cent in 2017).[33] Civilian vehicles are followed by vehicles belonging to national security forces (26 per cent) and peacekeeping vehicles (8 per cent).[34]

CASUALTIES PER INCIDENT AND LETHALITY RATIO

AVMs are designed to be triggered by and destroy vehicles and, due to their large explosive charge, tend to cause several casualties. While the global average of people killed or injured per AVM incident reached 2.9 in 2017, significant variations can be observed across states and territories. The average number peaks at 5.22 casualties per incident in Chad (see Table 2), where three out of nine recorded incidents caused 10, 12 and 18 civilian casualties, respectively. This is a considerably higher ratio than the 3.5 casualties per incident the year before. It is significant that two of these three incidents were related to gold mining activities in the Zouar area in Tibesti region (see Box 1).

In addition to the spike in Chad, other states also witnessed a noticeable increase in the number of casualties per incident, including Pakistan (from 2.89 in 2016 to 4.35 in 2017) or Mali (from 2.12 in 2016 to 3.10 in 2017). In other states, the average remained at a constantly high level such as in Yemen (4.57 in 2016 and 4.67 in 2017) or Ukraine (2.73 in 2016 and 2.39 in 2017).

TABLE 2 CASUALTIES PER INCIDENT AND LETHALITY RATIO IN 2017

State/ territory	Recorded incidents	Number of casualties	Average No. casualties/ incident	Per cent of casualties that were civilians	Per cent of casualties that were killed
Pakistan	31	135	4.35	52%	37%
Ukraine	31	74	2.39	27%	26%
Mali	20	62	3.10	44%	16%
Iran	13	12	0.92	100%	25%
Chad	9	47	5.22	98%	40%
Yemen	9	42	4.67	19%	55%
Syria	9	18	2.00	89%	94%
Western Sahara	9	12	1.33	25%	0%

The number of casualties per incident depends to a great extent on the nature of the vehicle involved, in addition to the number of passengers. It can, for instance, be noted that the decline in incidents with civilian vehicles in both absolute and relative terms from 2016 to 2017 (see above) contrasts with the simultaneous increase in civilian casualties in the same period of time. Incidents with a civilian vehicle therefore led to a higher average number of casualties: the casualty rate per incident involving a civilian vehicle (excluding humanitarian) rose from 1.95 in 2016 to 3.07 in 2017. The corresponding rate for overall non-civilian vehicles reached 2.92 in 2017, only slightly higher than the year before. In 2017, national security forces suffered the highest average level of casualties per incident (see Table 3).

TABLE 3 CASUALTIES PER INCIDENT AND LETHALITY RATIO PER CATEGORY OF VEHICLE IN 2017

Category of vehicle	Recorded incidents involving vehicles	Number of casualties	Average No. casualties/ incident	Per cent of casualties that were killed
Civilian	70	215	3.07	40%
National security forces	41	143	3.49	24%
Peacekeeping	12	30	2.50	20%
Other combatants	8	17	2.13	29%
International security forces	6	11	1.83	18%
Humanitarian	5	9	1.80	44%
Unknown	16	47	2.94	36%

Similarly, the type of vehicle affected how deadly an incident was. The lethality rate, understood as the ratio of killed to overall casualties, of incidents with civilian vehicles (excluding humanitarian) in 2017 reached 40 per cent, while the rate with overall non-civilian vehicles was 23 per cent. At the level of individual categories, incidents with humanitarian vehicles recorded the highest lethality rate with 44 per cent (see Table 3).

These differences stem partly from the assumption that non-civilian vehicles are more likely to be better armoured and protect passengers from the effects of explosions than civilian vehicles.

BOX 2 CASE STUDY AFGHANISTAN

Afghanistan is considered to be one of the most mine/ERW-affected countries in the world. Contamination is mainly due to the 10-year-long conflict that erupted with the invasion of Afghanistan by the former Soviet Union in 1979, but it is also a result of internal armed conflict between 1992 and 1996 and the ongoing conflict subsequent to the toppling of the Taliban in 2001.[35] 30,716 people were recorded as known casualties at the end of 2017, of which close to 1,500 were due to AVMs.[36]

The majority of AVMs in Afghanistan are of low-metal content and were often laid without any pattern or evident record-keeping. Of the remaining known (suspected and confirmed) contamination of 654.1 km^2 by the end of 2017, more than half of the area relates to AVMs (including mixed minefields), especially in Kandahar, Helmand and Farah provinces. However, new hazards from legacy AVM contamination are constantly being discovered, with a total of 115 km^2 between 2014–2017.[37]

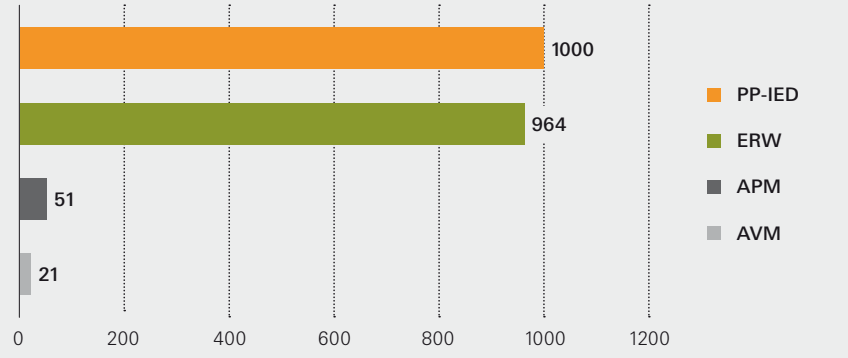
FIGURE 11 DEVELOPMENTAL IMPACT OF AVM CONTAMINATION ON AGRICULTURE IN KANDAHAR PROVINCE

Note: Highlighted in red are suspected or confirmed hazardous areas with no demining operations; in orange, where demining operations were ongoing as of December 2017.

Further to its humanitarian impact, AVM contamination exerts a considerable strain on the country's development. 37 out of 260 planned development projects at the end of 2017, related to road or railway infrastructure, and exploitation of natural resources, such as copper and oil, were hindered by AVMs. 61 per cent of AVM contamination affects agricultural production.[38] This is exemplified in Figure 11, which shows an area in Kandahar province contrasting cultivated (green) and fallow land, the latter unexploited since it is contaminated.

In 2017, the GICHD and SIPRI recorded eight AVM incidents causing 21 casualties, a 38 per cent decrease compared with the two previous years (34 casualties each year). The level of AVM casualties contrasts with that for APM, ERW and so-called pressure-plate improvised explosive device (PP-IED) casualties (see Figure 12).[39] The United Nations Assistance Mission in Afghanistan (UNAMA) noted an overall decrease of civilian casualties from most of these devices in 2017.[40] This should not, however, mask the upward trend of the preceding years.[41]

FIGURE 12 COMPARISON OF CASUALTIES PER DEVICE TYPE IN AFGHANISTAN IN 2017



According to UNAMA, improvised mines constructed as PP-IEDs in Afghanistan "function as victim-activated devices, triggered by any person stepping on them […] or any vehicle driving over them."[42] In 2017, they accounted for 10 per cent of the overall number of civilian casualties in Afghanistan, especially in Helmand, Kandahar

and Uruzgan provinces in which hostilities continued and where devices were placed on roads used by military forces, but equally frequented by civilians.[43]

The scale of PP-IEDs—and victim-operated improvised explosive devices at large—functioning as improvised AVMs is currently insufficiently understood, both at global level and in Afghanistan, due to a lack of institutionalised and rigorous data disaggregation. In an initial attempt to overcome this gap, the Directorate of Mine Action Coordination of Afghanistan used a proxy assumption whereby PP-IED incidents with more than two casualties were considered to be more likely related to an improvised AVM.[44] This analysis presents the following estimates:

TABLE 4 ESTIMATED DISAGGREGATION OF PP-IED INCIDENTS AND CASUALTIES IN AFGHANISTAN IN 2017[45]

Afghanistan	Number of incidents	Per cent of incidents	Number of casualties	Per cent of casualties
Improvised APM	385	77%	499	50%
Improvised AVM	115	23%	501	50%
	500		**1000**	

This initial exercise illustrates that the impact of improvised AVMs may exceed that of industrially manufactured devices by several orders of magnitude. For such analysis and discussion to be meaningful and fully based on evidence, related data collection is required and methodological challenges addressed from the outset.

CONCLUSION

In 2017, the GICHD and SIPRI recorded 169 incidents related, or suspected to be related, to AVMs in 24 states and territories. This represents a slight decrease from 178 incidents in 2015 and 181 incidents in 2016. A total of 487 casualties including 321 injured and 166 killed were recorded from these incidents, a 15 per cent increase compared with 2016. As in previous years, civilians were the most affected category of casualties (51 per cent) followed by national security forces (28 per cent).

From 2015 to 2017, the GICHD and SIPRI collected evidence of 528 incidents related, or suspected to be related, to AVMs causing 1,508 casualties. Ukraine, Pakistan, Mali, Syria and Yemen accounted for the highest numbers of casualties, representing two-thirds of global casualties in this three-year period.

In particular, this report illustrates the relationship between casualty and lethality rates on the one side, and casualty demographics and types of vehicles on the other. In 2017, incidents with civilian vehicles tended to lead to a higher average of casualties than those with non-civilian vehicles. Similarly, civilians are significantly more vulnerable to fatalities than non-civilians.

For three consecutive years, the GICHD and SIPRI have consolidated the evidence on the extent, geography and patterns of the direct humanitarian impact of AVMs. Various issues deserve, however, to be scrutinised in greater depth. As illustrated by the case study on Afghanistan in this report, the scale and impact of AVMs of an improvised nature are presumably significant. Yet, comprehending the full magnitude of AVM impact requires more data, consistently coded and disaggregated across contexts.

Finally, greater focus is required to increase the evidence on the nexus between contamination from explosive ordnance at large, and from AVMs in particular, and the cost-effectiveness of humanitarian aid delivery, the return of the displaced in safety and dignity, and the returnees' efforts to rebuild their lives and lay the foundations for sustainable development. This appears to be ever more relevant at a time when the international community is working towards an effective response to the global refugee and migration crises.

ANNEX 1: RESEARCH METHODOLOGY

Research methodology

This research draws on data from states, typically national mine action authorities/centres, as well as from mine action and other humanitarian organisations. These reports were complemented by media reviews conducted in Arabic, English, French, Portuguese, Russian, Spanish and Urdu. Due to the high number of recorded incidents and casualties in Ukraine in 2015 and 2016, a media review in Ukrainian was added in the 2017 review.

Press articles were included, either because an incident was specially identified as AVM-related, or because an incident corresponded to a set of criteria that strongly indicated an AVM-related incident. These criteria included incidents such as those on roads outside of a city involving a vehicle, but excluding remotely-detonated or suicide bombs, and causing multiple casualties. In cases where the criteria strongly suggests an AVM-related incident, the incident is referred to as a suspected AVM incident. In some instances, mine action authorities and organisations were able to assess the relevance and accuracy of retrieved press articles.

IEDs may function as improvised AVMs.[46] Focusing on industrial AVMs used in a conventional manner, this report excludes data related to AVMs of an improvised nature.

Incidents with an unknown number of casualties were categorised as incidents that resulted in casualties, but without specifying any absolute number. For incidents referring to a minimum number of casualties ("at least [number] casualties"), this minimum number was retained in this research. Furthermore, unless clearly attributed in the source, the vehicle category for incidents involving other combatants was defined as "unknown".

The GICHD and SIPRI do not claim that the statistics presented in this report are complete and acknowledge possible under-reporting of casualties, nor do they claim responsibility for the accuracy and reliability of incident and media records retained for this report.

Data collection challenges

Data reported by states and organisations remain insufficient for a number of reasons. In some instances, states with suspected AVM incidents do not release information on mine contamination or incidents. In other cases, data remain incomplete due to the inability of national mine action authorities or organisations to access certain areas of the territory. This is often a challenge in conflict areas where data collection and verification are particularly difficult. The nature of these weapons, and the fact that AVM incidents often take place in rural areas, also make their reporting challenging, specifically regarding the exact location of incidents.

Reports from states and organisations generally provide much more accurate and disaggregated information than media reports. Since the disaggregation of data is, to a large extent, dependent on reports from states and organisations, data collection becomes sensitive to the inactivity or closure of programmes due to a lack of funding or due to security concerns. This may, therefore, impact the ability to access detailed data from certain areas and to analyse trends and differences over years. The GICHD and SIPRI are continually engaging with new stakeholders in states/territories specifically in conflict areas, in order to ensure the most complete and long-term data collection.

Disaggregation of collected data based on the type of device is also a challenging task. It is often difficult to identify an AVM after detonation, in particular if specific circumstances, resources and the security situation do not allow a proper investigation to take place. In 2017:

- 23 incidents (14 per cent) were categorised as confirmed AVM incidents with an identified or likely mine type;
- 59 incidents (35 per cent) were categorised as confirmed AVM incidents with an unknown device type;
- 87 incidents (51 per cent) were categorised as suspected AVM incidents.

Despite their higher availability than in previous years, collecting disaggregated data on the sex and age of casualties still remains a challenge. In 2017, it was only possible to access data disaggregated by sex in 58 per cent of casualties and by age in 43 per cent of casualties.

ANNEX 2: NOTES AND REFERENCES

1 In this report, AVMs are defined as landmines designed to detonate by the presence, proximity or contact of a vehicle. It covers a wide range of vehicles that operate on land including tanks. AVMs are also commonly known as anti-tank mines as well as mines other than anti-personnel mines.

2 Casualties refer to individuals who were physically injured or killed.

3 Stockholm International Peace Research Institute and the Geneva International Centre for Humanitarian Demining (2014), *The Humanitarian and Developmental Impact of Anti-Vehicle Mines* (Geneva: GICHD and SIPRI).

4 GICHD–SIPRI interactive maps are available at http://www.gichd.org/avm (Accessed: 1 March 2018).

5 Stockholm International Peace Research Institute and the Geneva International Centre for Humanitarian Demining (2016), *Global Mapping and Analysis of Anti-Vehicle Mine Incidents in 2015* (Geneva: GICHD and SIPRI); Stockholm International Peace Research Institute and the Geneva International Centre for Humanitarian Demining (2017), *Global Mapping and Analysis of Anti-Vehicle Mine Incidents in 2016* (Geneva: GICHD and SIPRI).

6 Figures in this report are subject to rounding up/down.

7 The definition of territory rests on the United Nations definition of Non-Self-Governing Territories. In this report, territories are italicised.

8 The 31 recorded incidents in Pakistan consist of 1 confirmed and 30 suspected AVM incidents and strongly rely on data shared by the non-governmental organisation, Sustainable Peace and Development Organization (SPADO). The GICHD–SIPRI methodology tends to be more restrictive than the one used by SPADO by excluding incidents that may more likely be related to remote-controlled improvised explosive devices or mines of an improvised nature. Of the 31 incidents recorded in Ukraine, 8 were confirmed as AVM incidents by the Organization for Security and Co-operation in Europe Special Monitoring Mission to Ukraine (OSCE SMM). A difference in methodology between GICHD–SIPRI data collection and that of the OSCE SMM has to be noted. According to its working methodology, the OSCE SMM corroborates every case "by consulting [triangulating] at least three independent sources, gathering accounts from victims and witnesses, speaking with medical workers, law enforcement officials, military personnel, members of armed formations and other interlocutors. [...] The corroboration process depends on the operational environment. In order to carry out its mandated tasks, the [OSCE] SMM's freedom of movement is critical." Restrictions to its freedom of movement undermine the OSCE SMM's ability to access incident sites, hospitals and morgues. Furthermore, "the corroboration process can take time [weeks, months] and the Mission reviews the status of cases as information becomes available. When information is unclear, the Mission does not record a case as confirmed until more satisfactory or reliable information is obtained." See Organization for Security and Co-operation in Europe Special Monitoring Mission to Ukraine (2017), *Thematic Report: Civilian casualties in Eastern Ukraine 2016* (OSCE SMM), pp. 2-3.

9 While the Landmine Monitor has not recorded an AVM incident in Zimbabwe since 1999, the Zimbabwe Mine Action Centre has pointed to one incident in the Chitungwiza suburb of Harare in May 2013 causing four fatalities, including one infant, when "people brought anti tank [mines] in a bid to open them in a house [...]. This was in the belief that they could find [...] mercury which is believed to be very expensive." Previously, AVM incidents occurred during the ceasefire period in the 1980s. E-mail from Capt. Cainos Tamanikwa, National Coordinator, Zimbabwe Mine Action Centre, 23 March 2018; Historical AVM data for Bosnia and Herzegovina and Russia were taken from the Landmine Monitor, based on an e-mail from Loren Persi, Victim Assistance Research Coordinator, Landmine Monitor, 25 February 2016.

10 In 2016, the GICHD and SIPRI recorded 181 incidents related, or suspected to be related, to AVMs in 22 states and territories that caused 423 casualties (228 injured and 195 killed). The Landmine Monitor reported on 495 casualties. Due to the GICHD and SIPRI undertaking a more focused and disaggregated data collection on AVM incidents and due to varying methodologies, comparison with Landmine Monitor findings might only be possible to a limited extent.

11 The GICHD and SIPRI recorded 74 and 52 casualties in Pakistan in 2015 and 2016 respectively.

12 While SPADO in Pakistan has contributed to this research since 2015, collaboration was strengthened in 2017 via a more structured exchange of data.

13 This analysis on the years since last conflict year is based on the definition of conflict by the Uppsala Conflict Data Program (UCDP). The UCDP defines an armed conflict (state-based) as "a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year" (see for instance Wallensteen Peter and Sollenberg Margareta (2001), "Armed Conflict, 1989–2000", *Journal of Peace Research,* 38(5), pp. 629–644). In order to fill the gap that exclusively focusing on armed conflict involving at least one government of a state might cause, non-state conflict was also considered in the calculation. A non-state conflict is defined by the UCDP as "the use of armed force between two organized armed groups, neither of which is the government of a state, which results in at least 25 battle-related deaths in a year" (see Sundberg Ralph, Eck Kristine and Kreutz Joakim (2012), "Introducing the UCDP Non-State Conflict Dataset", *Journal of Peace Research,* 49(2), pp. 351-362). For more details on definitions, see UCDP/PRIO (2016), *Armed Conflict Dataset Codebook, Version 4-2016*, available at http://ucdp.uu.se/downloads/ucdpprio/ucdp-prio-acd-4-2016.pdf (Accessed: 6 March 2018); UCDP (2017), *UCDP Non-State Conflict Codebook, Version 2-2017*, available at http://ucdp.uu.se/downloads/nsos/ucdp-nonstate-172.pdf (Accessed: 3 April 2018).

14 While the GICHD and SIPRI recorded 598 and 423 casualties in 2015 and 2016 respectively, the Landmine Monitor recorded 459 and 495 casualties in 2015 and 2016 respectively. Between 2012 and 2014, the Landmine Monitor reported 218 AVM casualties for 2014, 212 for 2013 and 320 for 2012 (in total 750 for 2012–2014). See International Campaign to Ban Landmines (2017), *Landmine Monitor 2017*, p. 58; International Campaign to Ban Landmines (2016), Landmine Monitor 2016, p. 51;

International Campaign to Ban Landmines (2015), *Landmine Monitor 2015*, p. 28; International Campaign to Ban Landmines (2014), *Landmine Monitor 2014*, p. 35. Note: Since 2015, the GICHD and SIPRI have shared, cross-referenced and compared data with the Landmine Monitor. Landmine Monitor methodologies used to enter data may differ, resulting in differences in reported annual casualties.

15 Cambodian Mine Action and Victim Assistance Authority (2017), *Cambodia Mine/ERW Victim Information System Monthly Report for December 2017*, p. 5.

16 Landmine Monitor (2017a), "Chad Country Profile. Mine Action, page updated as of 11 December 2017", http://the-monitor.org/en-gb/reports/2017/chad/mine-action.aspx (Accessed: 3 April 2018).

17 *Ibid.*

18 *Ibid.*; Small Arms Survey and Conflict Armament Research (2017), *Tubu Trouble: State and Statelessness in the Chad-Sudan-Libya Triangle* (Geneva: SAS), p. 40.

19 Small Arms Survey and Conflict Armament Research (2017), *op. cit.*, pp. 40-41.

20 Some incidents might appear as one on the map, due to their geographical proximity and the scale of the map.

21 Landmine Monitor (2017b), "Chad Country Profile. Casualties, page updated as of 13 July 2017", http://the-monitor.org/en-gb/reports/2017/chad/casualties.aspx (Accessed: 3 April 2018).

22 E-mail from Moussa Ali Soultani, Advisor at HCND, 29 March 2018.

23 E-mail from Olivier Shu, Technical Advisor Operations/Quality at HCND, 21 February 2018.

24 Small Arms Survey and Conflict Armament Research (2017), *op. cit.*, p. 81.

25 Small Arms Survey and Conflict Armament Research (2017), *op. cit.*, pp. 81-101; Lachkar Michel, "Tchad : l'orpaillage, source de conflits dans la région du Tibesti", *Franceinfo/Géopolis*, 26 October 2017.

26 Small Arms Survey and Conflict Armament Research (2017), *op. cit.*, p. 41.

27 In this report, the term "national security forces" refers to national military, police and border guard personnel.

28 In this report, the term "international security forces" refers to international armed forces who are present in a conflict outside the mandate of a peacekeeping mission.

29 Excluding the category "unknown" (42 casualties), the percentages per category of casualties would be as follows (out of 445 casualties): civilians 56%, national security forces 31%, peacekeepers 7%, other combatants 4% and international security forces 2%.

30 In this report, the OSCE SMM is considered as a peacekeeping mission.

31 In this report, the definition of children is based on article 1 of the Convention on the Rights of the Child whereby children are considered to be persons below the age of eighteen years. See Convention on the Rights of the Child, 1577 UNTS 27531.

32 Due to rounding up/down, percentages of this breakdown figure may exceed 100 per cent.

33 Civilian commercial vehicles are those related to business activities such as land development or construction (e.g. bulldozer, excavator) and commercial transportation (e.g. trucks, vehicle carrying workers).

34 Excluding the category "unknown" (16 incidents), the percentages per category of vehicles would be as follows (out of 142 incidents): civilian 49%, national security forces 29%, peacekeeping 9%, other combatants 6%, international security forces 4% and humanitarian 4%.

35 Landmine Monitor (2017c), "Afghanistan Country Profile. Mine Action, page updated as of 11 December 2017", http://the-monitor.org/en-gb/reports/2017/afghanistan/mine-action.aspx (Accessed: 3 April 2018).

36 Landmine Monitor (2017d), "Afghanistan Country Profile. Casualties, page updated as of 13 July 2017", http://the-monitor.org/en-gb/reports/2017/afghanistan/casualties.aspx (Accessed: 3 April 2018); Abdul Qudous Ziaee (2017), *The Challenge of AV mines in Afghanistan* (Presentation at the ICRC-ISIL Conference on the Convention on Certain Conventional Weapons, New Delhi, India, 6 December 2017); e-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 18 March 2018.

37 Abdul Qudous Ziaee (2017), *op. cit.*; e-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 18 March 2018.

38 22% of remaining known AVM contamination has an impact on road construction, 13% on housing, 2% on water, 1% on other infrastructure (e.g. bridges) and 1% on historical heritage sites. See Abdul Qudous Ziaee (2017), *op. cit.*

39 Data retrieved from the Information Management System for Mine Action in Afghanistan. E-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 18 March 2018.

40 In 2017, UNAMA documented 639 civilian casualties from ERW and 1,019 civilian casualties from PP-IEDs compared with 725 civilian casualties from ERW and 1,102 civilian casualties from PP-IEDs in 2016. It is also worth noting that in 2016, the Directorate of Mine Action Coordination of Afghanistan recorded 120 casualties from APMs (against 51 in 2017), 1,195 from PP-IEDs (against 1,000 in 2017) and 604 from ERWs (against 964 in 2017). See United Nations Assistance Mission in Afghanistan and Office of the High Commissioner for Human Rights (2018), *Afghanistan. Protection of Civilians in Armed Conflict. Annual Report 2017*, pp. 16 and 31; e-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 18 March 2018; e-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 26 March 2018.

41 Landmine Monitor (2017d), *op. cit.*

42 United Nations Assistance Mission in Afghanistan and Office of the High Commissioner for Human Rights (2017), *Afghanistan. Protection of Civilians in Armed Conflict. Annual Report 2016,* p. 14.

43 United Nations Assistance Mission in Afghanistan and Office of the High Commissioner for Human Rights (2018), *op. cit.*, pp. 31-32.

44 Certain difficulty in considering and disaggregating improvised mines, activated by the presence, proximity or contact of a vehicle, stems from the fact that their exact trigger weight is not necessarily known, varies or might not be determined after an explosion. A low-pressure threshold might be indicative of a device designed to be (also) triggered by the presence, proximity or contact of a person.

45 E-mail from Abdul Qudous Ziaee, Operations Manager, UNMAS Afghanistan, 7 February 2018.

46 There is no universally accepted definition of an IED. However, the North Atlantic Treaty Organization for instance defines an IED as "a device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals and designed to destroy, incapacitate, harass or distract. It may incorporate military stores but is normally devised from non-military components." See North Atlantic Treaty Organization (2010), *Glossary of Terms and Definitions*, NATO document AAP-6(2010), p. 2-I-2.

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