



Lessons learned from demining accidents in Croatia and Bosnia and Herzegovina

Croatia, Biograd nM april 2017

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Demining Accidents and Mine Victims in the Republic of Croatia 2007 – 2017

- 1991-2017, in 138 demining accidents 227 people were injured out of which 67 fatalities.
- 1997- 2017, in 70 demining accident 101 people were injured out of which 36 fatalities.
- 2007-2017, in 23 demining accidents 28 people were injured out of which 11 fataly. (remark:one person was involved in two mine incidents).

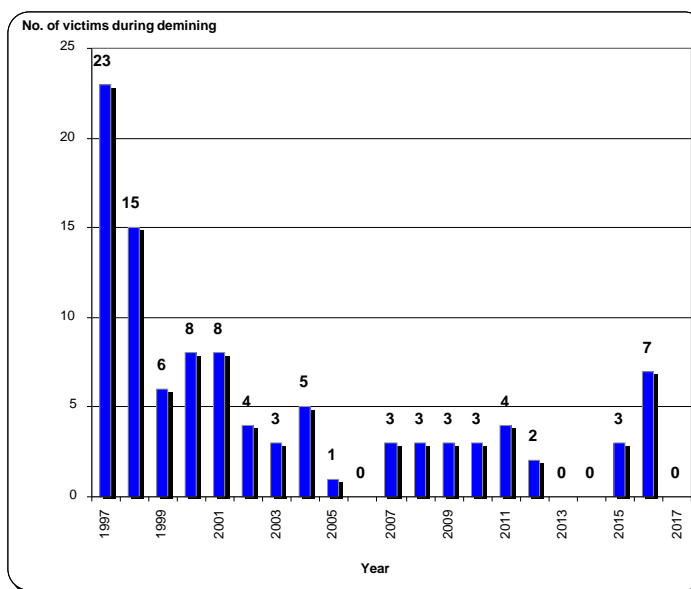
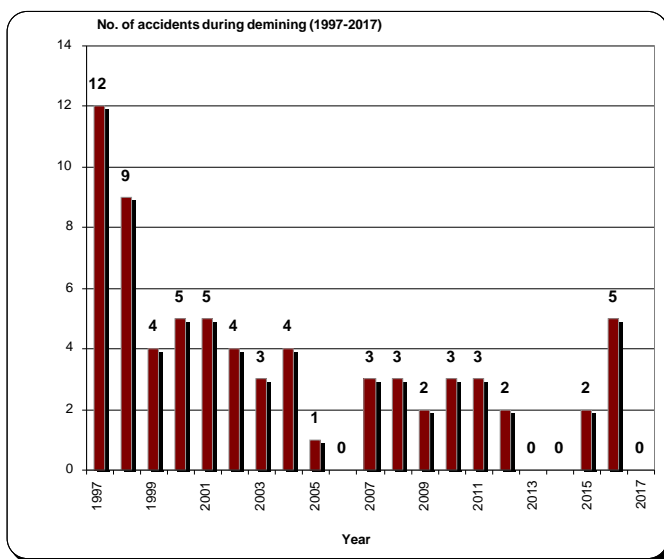


Diagram 1. Demining accidents and mine victims in the period 1997 – 2017

Data analysis of demining accidents in the Republic of Croatia

2007-2017

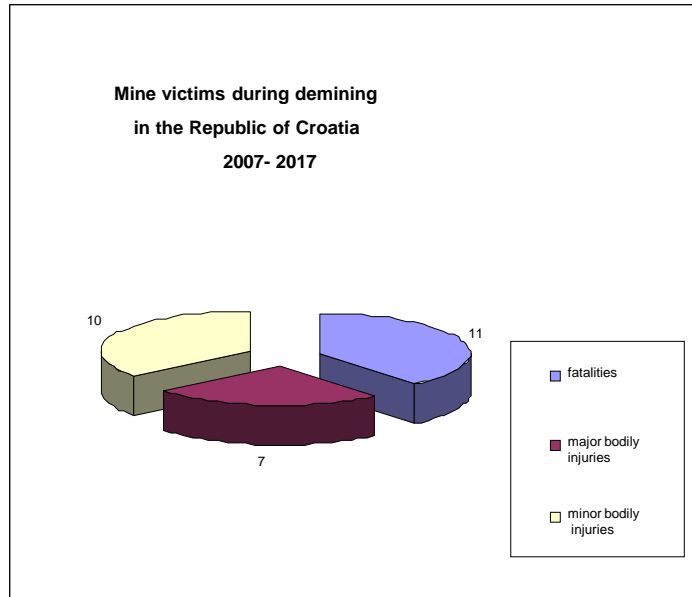


Diagram 2. Mine victims

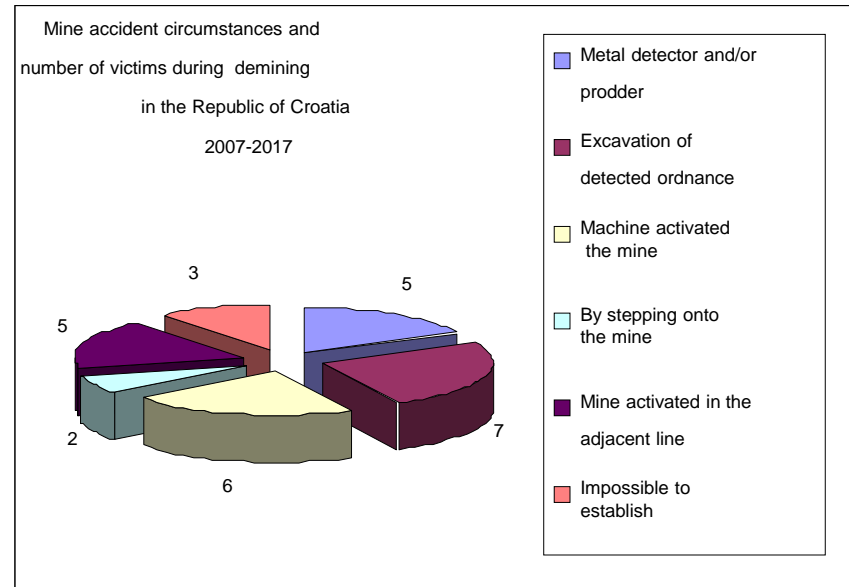
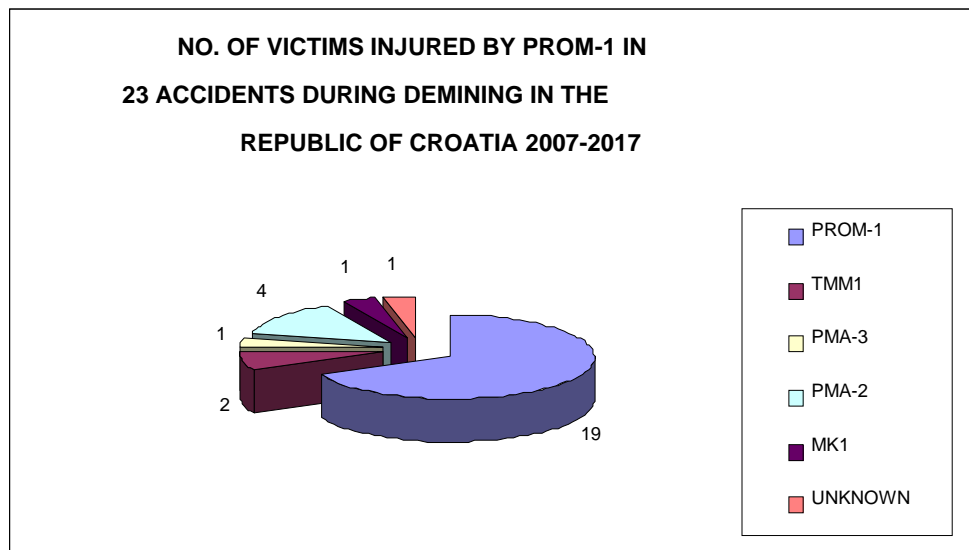


Diagram 3. Circumstances of demining accidents

By analyzing the circumstances of demining accidents it is noticeable that they primarily occurred **due to the excavation of detected metal fragment (in 7 accidents, 7 victims, 6 fatalities)** and during work with metal detector and/or prodder (in 5 mine incidents, 5 victims, 3 fatalities).

Data analysis of demining accidents in the Republic of Croatia 2007-2017



Photograph 1. Anti-personnel mine PROM-1 Diagram 4. Number of mine victims injured by PROM-1

Mines and explosive remnants of war (ERW) which have caused most injuries during demining activities are primarily anti-personnel mines **PROM-1 (in 14 accidents, 19 victims, 9 fatalities, 3 with major bodily injuries and 7 with minor bodily injuries).**

Data analysis of demining accidents in the Republic of Croatia 2007-2017

Analyzing data related to :

1. **Type of soil in demining accident** - on the soil which is flat, dry and hard (in 8 accidents, 12 victims, 9 fatalities).
2. **The vegetation** - that majority of demining accidents and injured victims happened in high vegetation, forests (6 accidents, 7 victims, 3 fatalities), low vegetation, grass (in 4 accidents, 7 victims, 3 fatalities).
3. **Number of mine victims in demining accidents** in the last ten years has mostly been individual (in 20 accidents, 21 victim was injured, 8 fatalities).
4. **Time of the mine incidents** :in the summer months (8 accidents, 10 victims, 4 fatalities) the beginning of the week, mostly on Wednesday (5 accidents, 6 victims, 5 fatalities). Most accidents occurred in the morning, from 8 until 10 AM (7 accidents, 8 victims, 5 fatalities).
5. **The most common location of injury** : Lika-Senj County (4 accidents, 6 victims, two fatalities)
6. **Working experience of injured deminers (in years)**- 5 - 10 years
7. **The age of injured deminers (the highest number)** -30 - 40 years

Lessons learned from demining accidents in the Republic of Croatia (2007-2017)

Fatality rate in demining accidents in the Republic of Croatia in the last ten years (2007-2017) is approximately **50%** (11 fatalities in 23 mine incidents).

The most common circumstances of demining accidents -**excavation of detected metal**

PROM-1 - In 80% of mine incidents, injury ends with death

In the period 1997-2017, out of 101 injured victims, 56 were fatalities and in the period 2007-2017 in 23 mine incident, 19 people were injured (67.8%) out of which 9 fatally. The profession has to face this fact and provide a solution how to minimize the risk of further incidents

Demining accidents occur on a flat, **hard and dry soil**

Mechanical soil treatment reduces mine incidents

Vegetation demining accident **has no effect**

Deminers in the Republic of Croatia (in 60% of cases) are injured between the age of 30 to 40 with 5 to 10 years of working experience

Lessons learned from demining accidents in the Republic of Croatia (2007-2017)

The majority of mine incidents occurred during summer months. Incidents occurred **in the first half** of the week, most critical is **Wednesday**. In the morning hours **(8:00-10:00 AM)**.

If we connect soil structure (dry, flat, hard) with previously noted facts, most harmful type of mine (PROM-1) and more frequent use of tools for metal detection excavation (hoes, spades) then it should not be taken as a surprise that summer months are most critical ones.

Protective equipment, protective vests and bulletproof vests are of crucial importance and their use **is unconditional**. (*This is confirmed by direct injuries of deminers when PROM-1 was activated by deminers or demining machine from the adjacent line. They all wore protective equipment and there were no fatalities in the adjacent line.*)

It is necessary **to provide conditions for more efficient evacuation** of injured persons in inaccessible areas (helicopters, transport as quickly as possible).

Notification of family members and assistance to the victims must be in accordance with the highest standards and principles of humanity but also legally supported and enabled

Additional training and education is absolutely necessary after a certain number of years

DATA COMPARISON

Analyzed data and causes of mine incidents / demining accidents	Bosnia and Herzegovina	Republic of Croatia
MINE INCIDENTS/DEMINING ACCIDENTS 1997-2017	79	70
Fatalities	50	36
Major bodily injuries	39	46
Minor bodily injuries	33	19
Total number of victims	122	101
MINE INCIDENTS/DEMINING ACCIDENTS 2007-2017	24	23
Fatalities	19	11
Major bodily injuries	7	7
Minor bodily injuries	9	10
Total number of victims	35	28 (27)
The most common mine and /or ERW – cause of mine incident / demining accident	PROM -1	PROM-1
Circumstances of injury	Violation of procedures in manual operations	Excavation of detected ordnance
Time of day /hour when the mine incident / demining accident occurred	9.00-10.00 AM	8.00 – 10.00 AM
The most common day of the week when the mine incident / demining accident occurred	Thursday – Sunday During weekend	Wednesday
The most common time of the year when the mine incident / demining accident occurred	March and August	Summer

The most common location of injury	Doboj – Maglaj	Lika – Senj County
The age of injured deminers (the highest number)	35-40 years	30 - 40 years
The age of injured deminers (the lowest number)	25-30 years	25-30 and 50 - 60 years
Working experience of injured deminers (in years)	More then 5 years	5 - 10 years
Number of injured persons in mine incident / demining accident		1 in 87% of incidents
The highest number of victims in one mine incident / demining accident	3	3
Type of soil in mine incident / demining accident	Different structures but with the possibility of use of prodder	Dry, flat, hard
Vegetation in mine incident / demining accident	Has an effect	Has no effect
Mechanical preparation of the terrain and clearing of vegetation	Affects the number of MI/DA	Reduces number of MI/DA
Demining safety measures taken	No	Yes
Safety distance during mine incident / demining accident	Not conducted - in all incidents injured more then one deminer	In accordance with Standard Operating Procedures
Protective equipment	In more than 70% of incidents not used	Yes
The evacuation and urgent medical aid	„No“ in 2 of 24 incidents	Yes (in all incidents)
Assistance to victims' family members	Yes – from the insurance	Yes

Table comparing analyzed data and the causes of mine incidents / demining accidents in the Republic of Bosnia and Herzegovina and Republic of Croatia

Findings

- a) Compatibility of the causes and consequences of demining accidents in the Republic of Croatia and Bosnia and Herzegovina was certainly influenced by very similar history of warfare.
- b) This problem in the past was unduly neglected in comparison to other issues.
- c) This problem requires further discussion, especially because of a growing number of demining accidents and incidents that become the subject of litigation.
- d) There are still a lot of open issues of which the most important are:
 - Are the procedures in manual clearance operations adequate for the areas where AP mines type PROM-1 can be certainly expected ?
 - Is the Standard for safety equipment at the required level ?
 - Additional training or introduction of repressive measures aimed at raising labor discipline ?
 - Procedure of the investigation, jurisdiction and authority ?
 - Exchange of the experience at the regional level ...

Therefore, the forthcoming 14th International Symposium "Mine Action 2017", organized by CROMAC will be an excellent opportunity to present our own and acquire new experiences.