



Alternative risk management measures for the environment at shooting ranges



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1. Executive summary

The Danish Sport Shooting Range Association believes a ban on lead ammunition will only invoke larger costs on its members as non-lead bullets still needs to be collected. To lessen the economic burden from implementation of environmental risk management measures (RMM's), it is suggested that a combination of existing and new solutions be deployed over a period of several years and that this is considered in the timeframe for implementation of a restriction. It's also suggested that a provisional arrangement is agreed upon where temporary solutions such as mounting of covers on existing berms to control water run of can be utilized.

The cost savings from keeping lead ammunition could possibly be used to install environmental RMM's.

2. Introduction

Viable alternatives and specific local challenges to the risk management measures presented in ANNEX XV RESTRICTION REPORT – Lead in outdoor shooting and fishing, dated 24 March 2021 (1) is presented in a collaboration between The Danish Technological Institute (DTI) and Skydebaneforeningen Danmark (Danish Sports Shooting Range Association).

The focus of this report will be on the environmental risk management measures (RMM) presented for shooting ranges. In Denmark, most of the around 250 shooting ranges are small individual associations with limited budget. Thus, an injunction enforcing large and expensive RMMs could be detrimental to the shooting associations in Denmark. In this report, it is the intention to present ideas on economical solutions that can effectively protect the environment from lead pollution.

The goal of this report is to support a further development of the sport and limit decommissioning of smaller facilities. In Denmark, the shooting ranges are organized in individual associations with a wide variety of firing stands, range types and number of users. By emphasizing the demand for flexible and unique solutions and presenting several alternative RMM's, it is suggested that a solution can be found where more time is given to implement new measures and individual needs for the shooting ranges can be met within the proposed legislative framework.

The economic strain put on the associations will also be presented, in the case where all ranges are to be equipped with relevant RMM's in the form of either individual bullet traps or berms with bullet catchers.

To protect the environment in Denmark around shooting ranges, the Danish Sports Shooting Association already have carried out technical investigations showing that lead from shooting ranges does not affect the quality of the groundwater (2,3). Also, the successful ban of lead in shotgun ammunition for hunting more than 20 years ago, demonstrates the Danish willingness to protect the environment, the societal effects of this ban was described by Niels Kanstrup (4), showing that it is possible, but takes time to fully introduce and accept such bans throughout a community.

Lead in the environment is something no one wants, but even if a ban on lead is introduced in sport shooting, bullets will most likely consist of materials critical to the environment (such as cobber) and consequently would need to be collected. A ban will then introduce both extra economic strain from higher prices on ammunition and expensive environmental RMM's. Generally, all ammunition is made

from valuable and environmentally taxing materials and should be collected and recycled to the largest extend possible.

To give an overview of the extend of the Danish shooting ranges with range type, number of ranges and number of firing stands, they are listed in table 1 below. The numbers are associated with some uncertainty and approximate numbers are emphasized using an interval. The data are obtained by The Danish Sport Shooting Range Association and assumed valid.

Table 1 Overview of Danish shooting ranges. Approximate numbers.

Range	Dis- tance	Gun type	Expected max target area	Ranges in Den- mark	Range size, firing stands	RMM type (Table 2)
50 m Sports rifle	50 m	Rifle	Ø 300 mm	233	5-50	2
Biathlon	25/50 m	Rifle/pistol	Ø 300 mm	- 10	5-15	2
25 m pistol	25 m	Pistol/re- volver	Ø 500 mm	142	5-40	1
IPSC – Pistol range	0-50 m	Pistol/re- volver	1.500x20.000 mm (in principle 360 de- grees)	- 15	1-4	6
Wild boar range Dynamic tar- get	50 m	Hunting rifle	1.500x20.000 mm (Target moving back and forth on rails.)	- 15	1 -2	4
Deer/moose Dynamic tar- get	80-100 m	Hunting rifle	2.000x30.000 (Target moving back and forth on rails.)	- 20	1-2	5
100 m rifle	100 m	Hunting rifle	Ø 700	- 70	2-10	3
200 m sports rifle	200 m	Hunting/ sports rifle	Ø 1000	125	2-40	3
300 m sports rifle	300 m	Hunting/ sports rifle	Ø1000	- 30	5-30	3
Terrain range	- 600 m	Hunting/ sports rifle	Ø 2000	1	12	4

3. Specific challenges and status at Danish shooting ranges

The members of the Danish Sport Shooting Range Association has a variety of sizes of permanent facilities which are very different in terms of economy, volunteer work, accessibility, and the possibility to introduce larger structures. Shooting ranges may be located at the end of a trail non accessible to cars and trucks or within naturally occurring hills making up the backstop berms. As many of the shooting ranges are old, the berms were initially for safety and subsequently also used as bullet catchers.

Shooting ranges that does not allow for the use of heavy machinery or large changes in naturally occurring berms will need specialized RMM's that will live up to the requirements in table 1-5 in (1), such as proper bullet containment, and roof covered lead impact zones or other means to control water runoff. Bullet traps that according to the CSR 2020 (5) should help collect a minimum of 90 % of the lead. In section 3, we will suggest alternative RMM's that can be used at such more remote locations. These more remote locations often are smaller associations with relatively low attendance and thus limited budgets. They do, however, represent a lot of the more diverse and specialized shooting ranges such as ranges with dynamic shooting targets or terrain ranges. The need for large and/or specialized RMM's can become an insurmountable challenge to take on for these associations. The need for more economic and flexible solutions is therefore paramount if the community and diversity in the Danish Sport Shooting Range Association shall survive such a restriction on lead in outdoor sports shooting.

The Danish Sport Shooting Range Association has some experience with technology for collection of projectiles at short distance and partly at long distance but cannot document efficiency at present. A few places have successfully installed the Polythermo Black magic and Polythermo 22LR or similar bullet trap products. The Danish Sport Shooting Range Association acknowledges that more knowledge and experience with bullet collecting solutions are needed.

4. Alternative and scalable risk management measures for Danish shooting ranges

The challenges described above call for flexible solutions. To illustrate some of the ideas and possibilities needed to realistically cover the demands for environmental RMM's across the Danish sport shooting ranges, three examples, used in Denmark, are presented here. It is not believed that these are the only solutions, just alternative solutions to those described in the restriction report (1). All three solutions represent easily scalable and flexible bullet trap solutions. Bullet traps of these types are claimed to have above 90 % recovery efficiency (1).

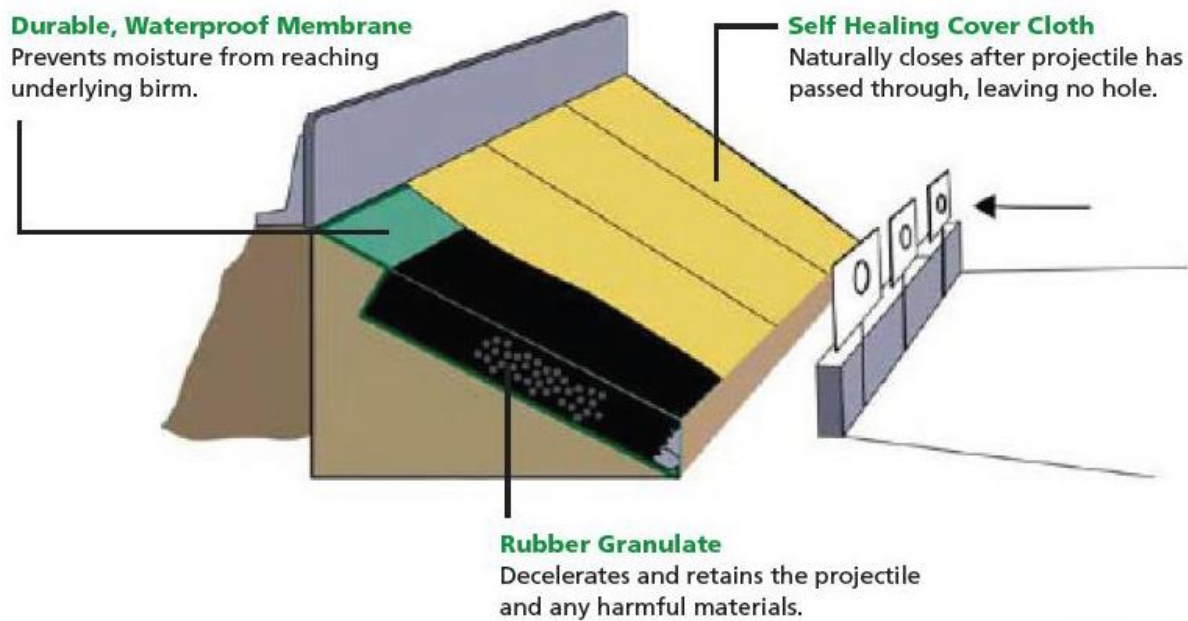


Figure 1 Military Equipment Denmark – The Environmental Bullet Catcher (EBC)

Based on the patented Swedish STAPP system (6), Military Equipment Denmark MED have with the EBC system, (figure 1) both a single and multi-lane solution for a covered backstop berm bullet catcher that contain the bullets. It is claimed to be ricochet-free and controls water runoff without the safety compromising roof cover.

The ability to deliver both multi-lane systems and single-lane systems opens for smaller ranges to also obtain RMM's of this kind.



Figure 2 Military Equipment Denmark - Movable bullet trap

Military Equipment Denmark also offers a movable bullet trap based in the German Regupol® tiles (7). This solution allows temporary or movable targets for both pistols and rifles (8).



Figure 3 Polythermo bullet trap (9)

The Polythermo Black Magic and 22LR is installed on some Danish shooting ranges. They can be installed outside as well as inside and are configurable to both pistols, revolvers, and small rifles.

As documented in the restriction report (1), RMM's have varying retrieval efficacy, depending on many factors such as distance, weapon type and local variations in collection schemes and procedures. Therefore, DTI suggest verifying the efficacy of several solutions at test facilities on specific Danish shooting ranges by careful monitoring of caliber and number of shots fired to ensure complete traceability of lead use and collection. This will allow monitoring of the collection efficacy of the specific RMM's and obtaining experience and develop best practices before implementation at the local shooting ranges. The goal should be a minimum 90 % retrieval of lead. This will ensure a high experience level can be transferred to each shooting range thus easing adoption of the new procedures.

As the existing berms can be covered quite easily it is suggested that a temporary solution such as mounting of covers on existing berms to control water run off can be allowed. The Danish Sport Shooting Range Association have in august 2021 produced a note together with Niels Kanstrup (Appendix 1, in Danish) explaining that it has not been documented that lead residues from rifles and pistols on outdoor sport shooting ranges have been found in wildlife. This backs up the main concern in the restriction report where it is related to hunting, mainly shotgun and to a lesser extend rifle hunting – and not sport shooting ranges. Therefore, a temporary solution involving covering existing berms and using them as bullet catchers should impose a negligible risk to the wildlife.

According to the Danish Sport Shooting Range Association, the collection and retrieval of ammunition are done by volunteers at the local range. In the Danish Sport Shooting Range Association, it is already an ongoing activity to inform their members on the working environment and health risk associated with collecting lead bullets. This work will be intensified along with introduction to the increased number of RMM's installed at the ranges. Focus will be on working environment for both volunteers and hired help and supporting shooting ranges with standard operating procedures, protective clothing, and guidance. All to safely increase the lead retrieval efficacy to 90 % as suggested in the CSR 2020 (5).

The Danish Sport Shooting Range Association intends to partner up with Danish partners and knowledge institutions to specifically design environmental RMM's for the needs in Denmark. As Danish shooting ranges are both old and new, local knowledge of the requirements is crucial for effective and economically viable solutions. Project funding is sought to be obtained through the Danish EPA (Miljøministeriet) in the Danish Eco-innovation program.

5. Economic evaluation

Implementation of RMM's throughout the Danish shooting ranges will be taxing the economies in the associations drastically. Even without cleanup of existing berms and other collection structures, it is estimated that with current available solutions a total of DKK 200 million or € 27 million is needed to install the RMM's. Add to that figure the more frequent collection and other running cost of the equipment. Under the Danish Sport Shooting Range Association, a total of 50.000 members are registered in the local associations. Every member is thus taxed with more than 550 €. An average subscription to the Danish shooting associations around 50 € per year, with a 100 % increase in subscription fee, the members will need 11 years to pay for the RMM's. As mentioned, many associations rely on volunteer work and does not see the attendance of the some of the larger shooting ranges. When looking at the economic burden for the different kinds of ranges shown in table 1, it became clear to The Danish Sport Shooting Range Association that some shooting ranges have much larger investments per user than others and as a result, the economic burden is skewed. Especially towards specialized ranges with dynamic targets or very long distances as they need much larger areas covered by the RMM's to trap the bullets. The Danish Sport Shooting Range Association is currently able to support its members when investing in shooting facilities with DKK 10 million (€ 1.5 million) p.a., some as grants and some as loans. The conclusion is that there is a strong need for flexible and affordable solutions and a realistic time frame for implementation if the diversity and the number of shooting ranges in Denmark are not to be drastically reduced.

Table 2 Overview of RMM's used for the economic evaluation.

No.	RMM Type	Supplier	Model	Price DKK (€)
1	Granulate bullet trap	Polythermo	Black Magic	15.000 (2000)
2	Granulate bullet trap	Polythermo	22 lr	3.500 (450)
3	Stapp Target	Stapp	Bullet trap	30.000 (400)
4	Stapp standard (10 lanes)	Stapp	EBC	350.000 (47.000)
5	Stapp wide (20 lanes)	Stapp	EBC	600.000 (80.000)
6	Other	Stapp	EBC	15.000 (2000)

Table 2 displays the approximate prices of the different existing RMM's used in the economic evaluation. The total cost is the total need of each RMM type across all the Danish shooting ranges, See appendix 1 for details. The approximate prices used here have been obtained by The Danish Sport Shooting Range Association from Danish shooting ranges using said RMM's or from contacts at the supplier.

6. Summary

The Danish Sport Shooting Range Association believes a ban on lead ammunition will only invoke larger costs on its members as non-lead bullets still needs to be collected. The CSR 2020 (5) lists a demand for a minimum lead retrieval efficacy of 90 % and the restriction report (1) details that current bullet traps can achieve these efficiencies, therefore it is believed that current solutions can be successfully introduced at the Danish shooting ranges, but only at an unrealistically high cost. To lessen the economic burden, it is suggested that a combination of existing and new solutions be deployed over a period of several years and that this is considered in the timeframe for implementation of a restriction. It's also suggested that a provisional arrangement is agreed upon where temporary solutions such as mounting of covers on existing berms to control water run of.

This period will be used to investigate new solutions and develop specialized bullet traps and environmental RMM's for the Danish market. BAT recommendations and standard operating procedures can then be distributed to all the shooting ranges ensuring the best possible outcome and efficacy of the new technology.

The cost of introducing environmental RMM's will be taxing to the Danish shooting ranges, some will make it, some will not, but it is paramount that the legislators understand the vulnerability of a system of small individual associations. It will become more costly for the members at the Danish shooting ranges whether a ban is invoked, or a 90 % lead retrieval requirement is. However, the cost savings from keeping lead ammunition could possibly be used to install environmental RMM's.

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