Best management techniques for shooting ranges

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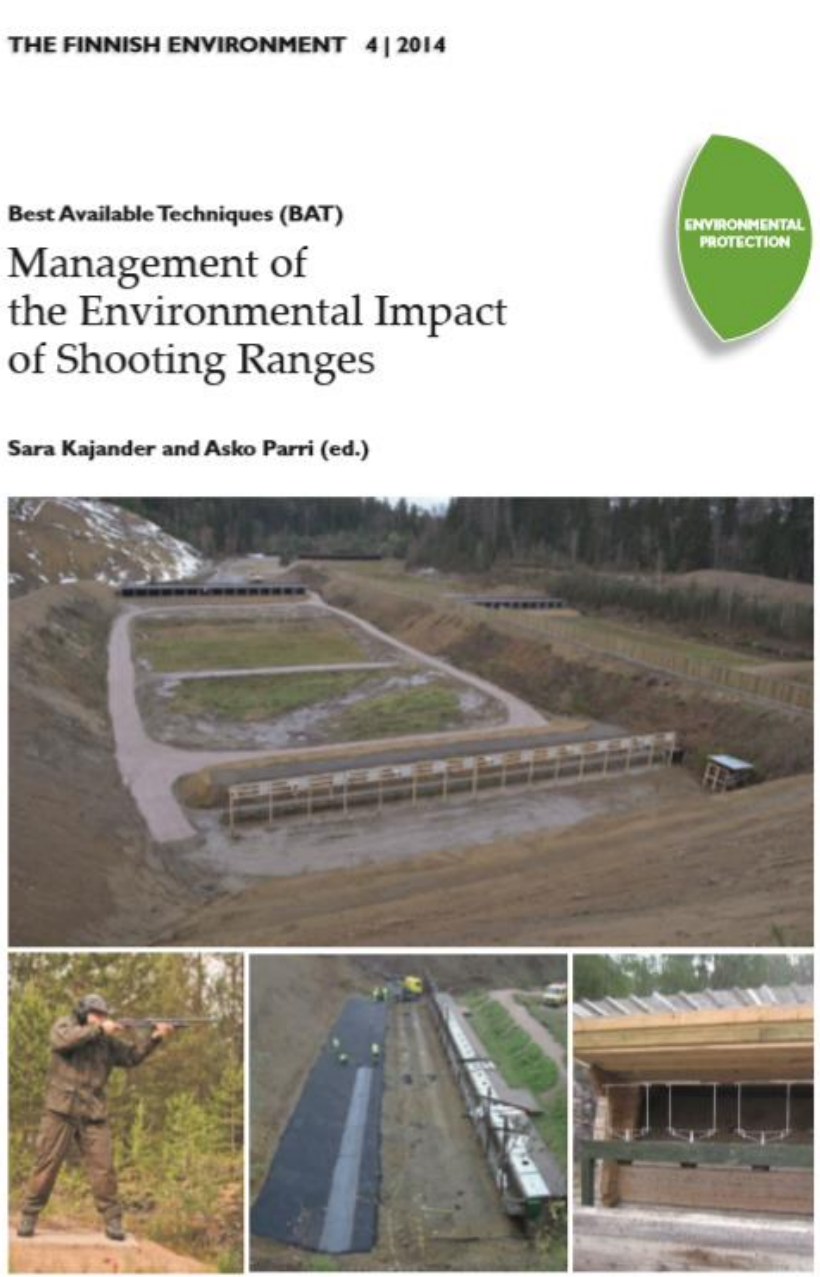
Shooting ranges

- Closed and controlled areas
  - 720 shooting ranges Finland
    - Firing lanes, targets, distribution area of shots and backstop
    - There are often structures for environmental protection such as sound barriers, bullet traps or water purification installations, that minimize the possible environmental impacts

Management of environmental impacts

- Environmental permit
  - All outdoor shooting ranges
  - Very detailed process
  - Site-specific conditions
  - Takes about 1-1,5 years
- The concept of Best Available Techniques (BAT) plays a very important role in the assessment of the requirement level of environmental protection during permit proceedings in accordance with the Environmental Protection Act



Environmental permit

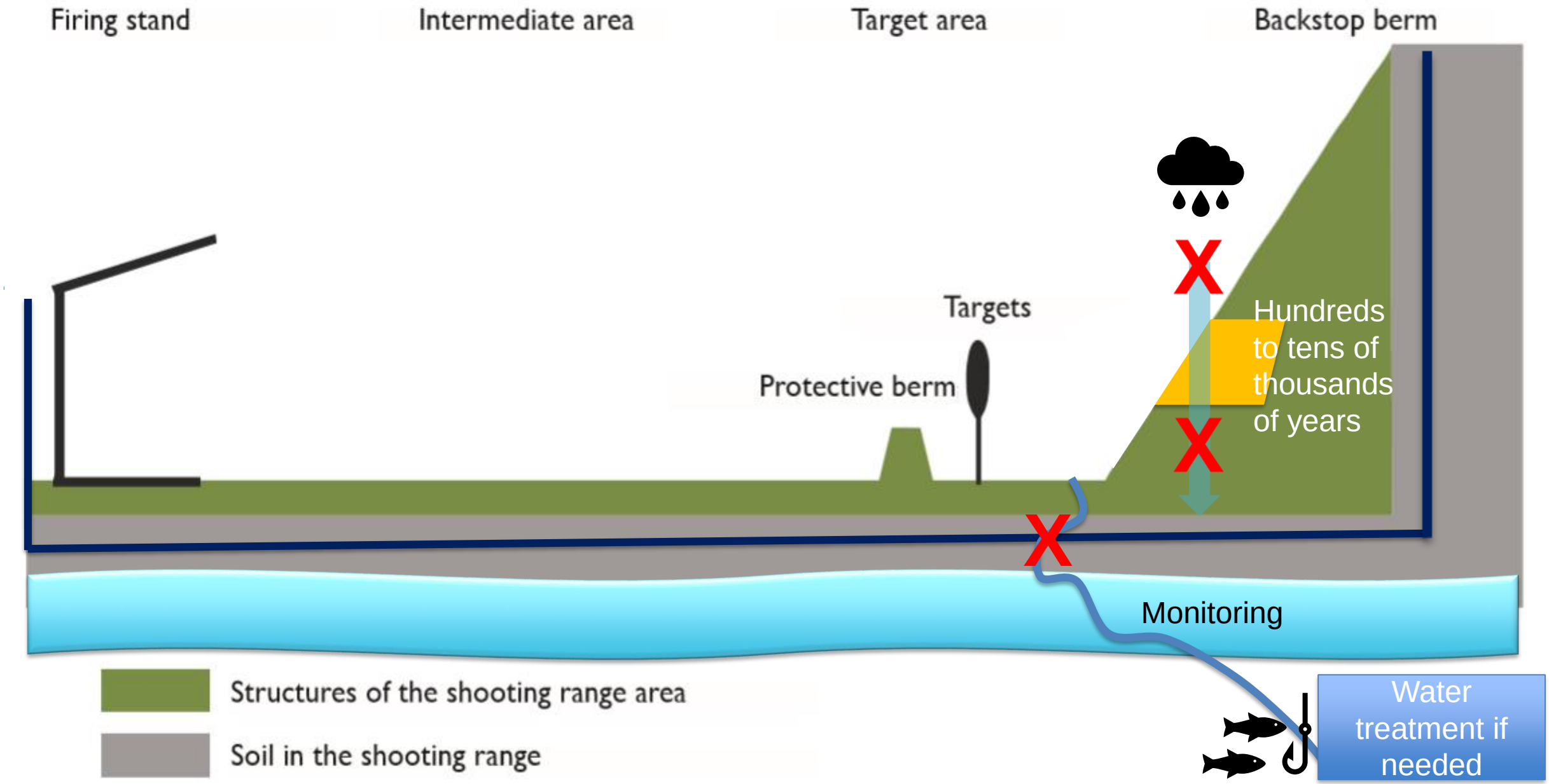
- Proves that the “Best Available Technology” and best practice guidelines are applied in environmental protection
- The need and method of pollutant emission management is determined site-specifically based on the operations and conditions, and the resulting environmental risk
  - Level 1 – low environmental risk
  - Level 2a – elevated surface water contamination risk, impact wider than local
  - Level 2b – elevated groundwater contamination risk that is targeted at a classified groundwater area or an aquifer used for household water supply
  - Level 3 – high environmental risk or detected environmental impact
- Plans to monitor and prevent the possible environmental effects

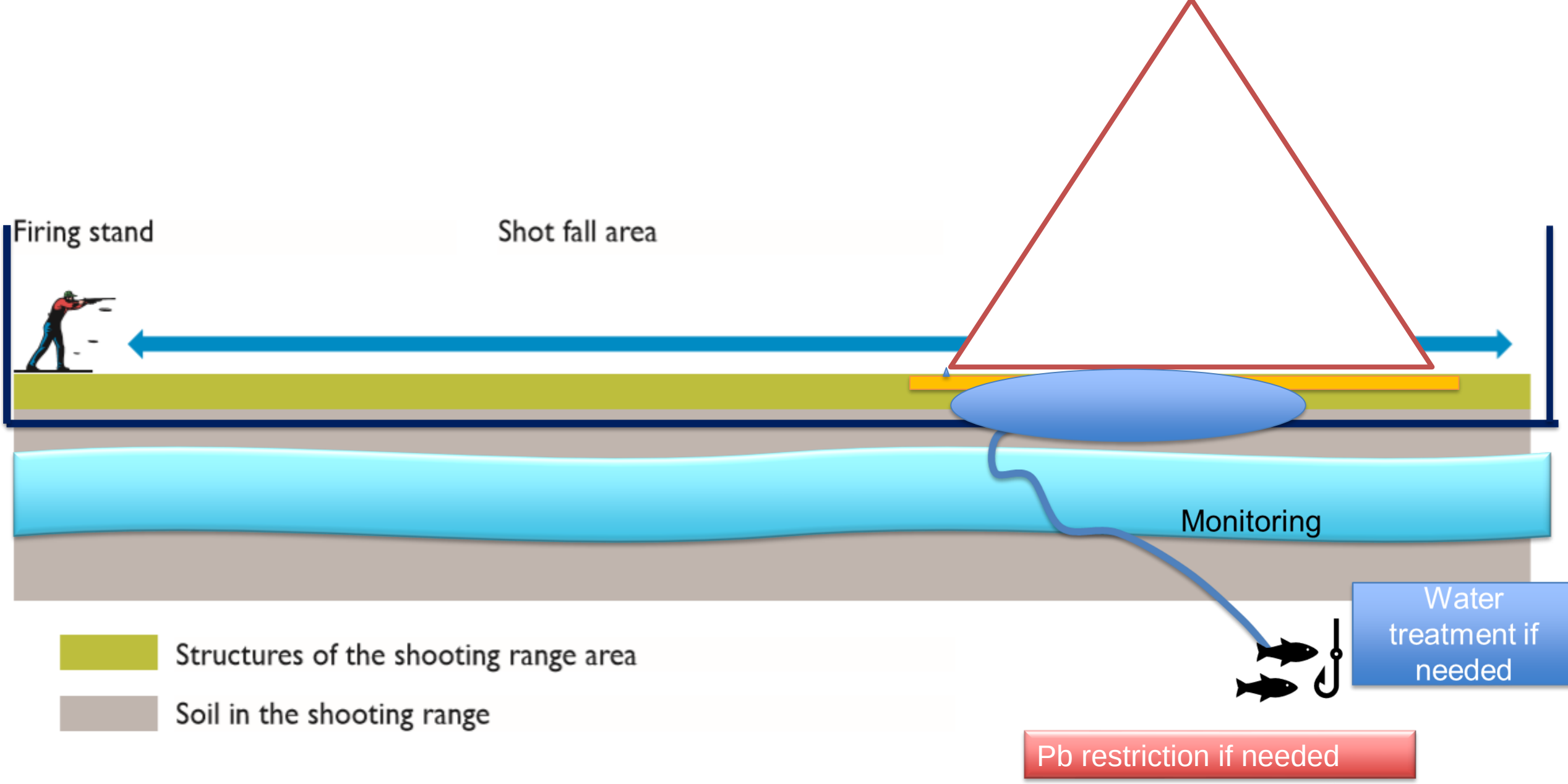
Background of pollutant emission management

- Shooting range activities do not cause immediate or short-term environmental impacts
- The migration of pollutants to the environment is typically extremely slow
  - Hundreds to ten thousand years
    - 16 000 – 120 000 years (GSF)

    → Monitoring
  - Bullets and shots are mainly stabile in the range structures
    - Removal of polluted range structure only if well-founded

Tarvainen et al. 2011


Firing stand
Intermediate area
Target area
Backstop berm
Targets
Protective berm
Hundreds to tens of thousands of years
Monitoring
Water treatment if needed
Structures of the shooting range area
Soil in the shooting range


Firing stand
Shot fall area
Monitoring
Water treatment if needed
Structures of the shooting range area
Soil in the shooting range
Pb restriction if needed

Assessment of pollutant risk level and choosing the risk management technique(s)

Emission potential

- Risk factors
  - Lead amount in range structure
  - Range age
  - Extent of loaded area: number of pistol and rifle lanes
  - Additionally, for shotgun ranges

Total pollutant load

Risk factors

Surface water

- Soil water permeability
- Mixing factor in the ditch departing from the range area
- Current situation, pollutant concentrations in the surface water and sediment
- Severity of the consequences of risk realisation

Groundwater

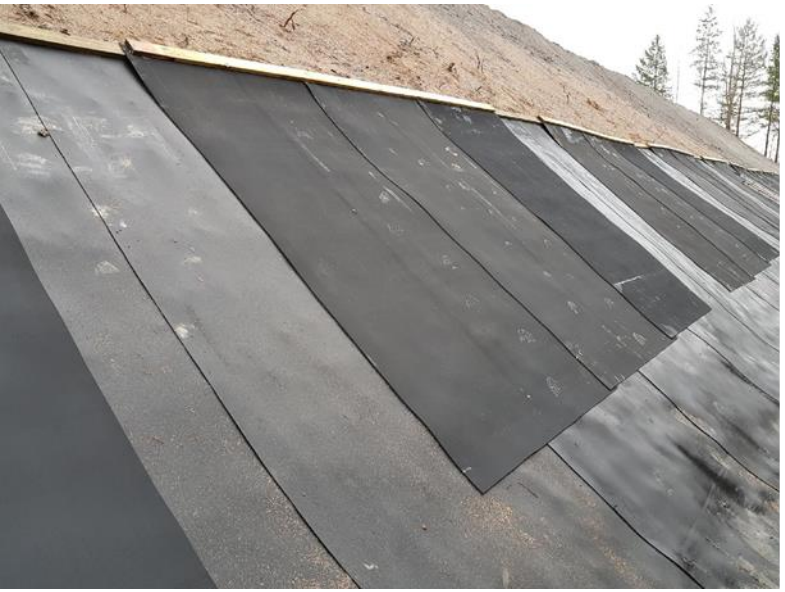
- Soil water permeability
- Distance to groundwater
- Current situation, pollutant concentration in soil, percolating water and groundwater
- Severity of the consequences of risk realisation

	Level 1	Level 2a	Level 2b	Level 3
	Basic level	**Demanding/surface water**	**Demanding/groundwater**	**Extremely demanding**
Significance of the pollutant risk	Low emission potential or moderate emission potential and low surface/groundwater risk	Moderate or high potential and moderate surface water risk	Moderate or high emission potential and moderate groundwater risk	Moderate or high emission potential and high surface/groundwater risk
Requirements, pistol and rifle ranges	Monitoring and reporting of use. Management of external water systems	Monitoring and reporting of use. Collection of water with pollutant content and, if necessary, treatment, or prevention of the formation of polluted water, or limiting the pollutant load	Monitoring and reporting of use. Collection of water with pollutant content and, if necessary, treatment, or prevention of the formation of polluted water, or limiting the pollutant load	Monitoring and reporting of use. Collection and treatment of water with pollutant content, or prevention of its formation, and also limiting the pollutant load
Requirements, shotgun ranges	Monitoring and reporting of use. Management of external water systems.	Monitoring and reporting of use. Management of surface waters, and the collection of water with pollutant content from the range area and, if necessary, treatment	Monitoring and reporting of use. Reduction of the size of the spreading area of the shot, and the limiting the pollutant load, and collection of water from the most critical area and, if necessary, treatment	Monitoring and reporting of use. Reduction of the spreading area of the shot, combined with limiting the pollutant load or management of the water in the range area
Technical solutions	Directing external waters	A case-specifically suitable solution		
Monitoring of the emissions and impacts	Not required as a rule. Case-specifically limited monitoring, every 3-6 y	Monitoring of the surface runoff and surface water in the range area, every 3-6 y	Monitoring of the percolating water of the backstop berm and/or groundwater every 1-3 y	Targeted according to impact every 1-3 y
Schedule		0–10 years or based on discretion	0–10 years or based on discretion	0-5 years

	No suitable technical solutions
Significance of the pollutant risk	New range, shooting into a wetland or a water body or groundwater level at the level of range structures or location in an area with a particular conservation value (significant impact)
Requirements, pistol and rifle ranges	Operations cannot be implemented in accordance with the BAT principles
Requirements, shotgun ranges	Operations cannot be implemented with the BAT principles
Technical solutions	
Monitoring of the emissions and impacts	
Schedule	

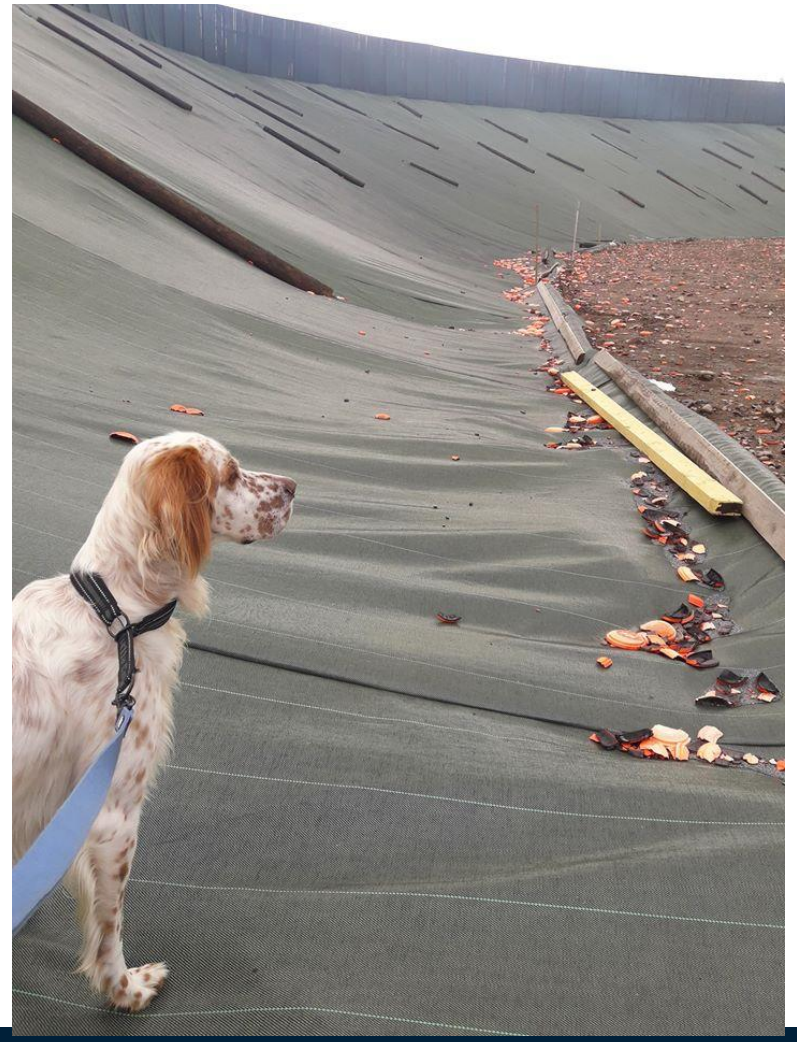
Several available cost-effectice techniques

- Covering the backstop berm and the target area
- Bullet traps
  - Metal, sand



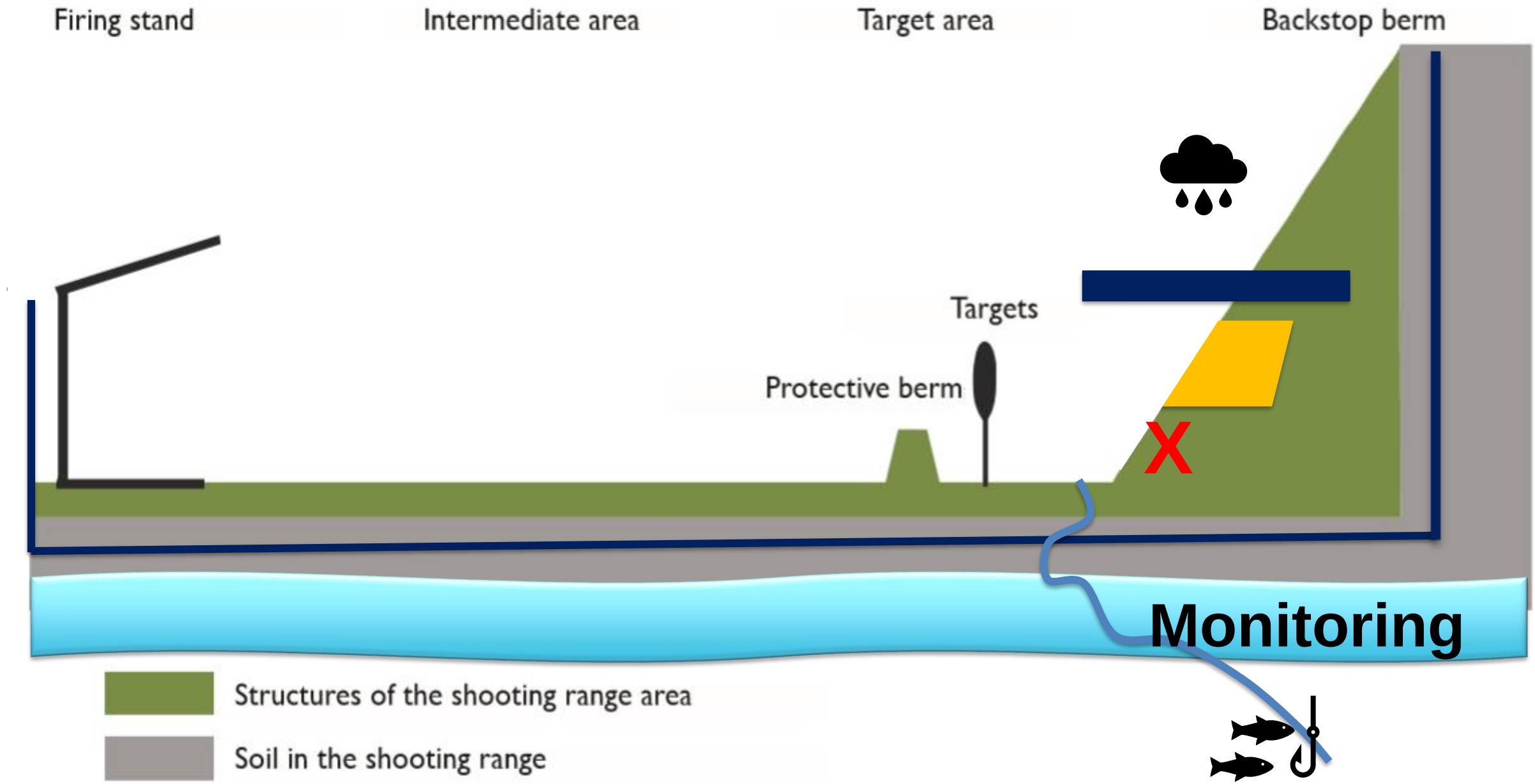
Bullet traps with a filler material

Shotgun ranges



Water management and monitoring

- If the structural solution of the shooting range causes pollutant content in water, the polluted water can be collected with lining and underground drains
- Water with pollutant content can be cleaned in a treatment well by filtration or in basins or ditch systems by sedimentation
- Monitoring


Firing stand
Intermediate area
Target area
Backstop berm
Targets
Protective berm
X
Monitoring
Structures of the shooting range area
Soil in the shooting range

Conclusions

- Site specific risk management practices are the most efficient way to manage and control possible impacts of
  - Several available and developing options
- We strongly suggest environmental permit system for shooting ranges as a more efficient way of protecting environment and humans – from lead and also from other substances

Thank you for your attention!