

## PhD project: Sustainable ecosystem resource management for shooting range remediation

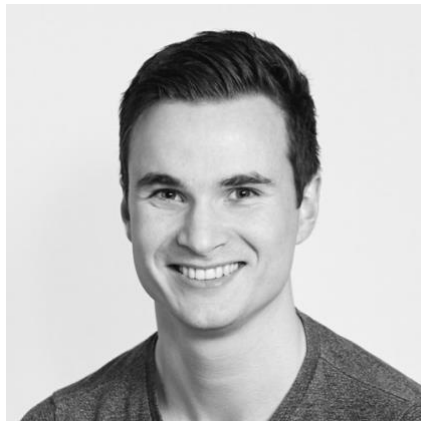
The Armed Forces' activities in shooting ranges pose a contamination risk to the surrounding environment, due to heavy metal deposition. To reduce the risk of contaminants to an acceptable regulatory level, traditionally invasive methods like excavation and disposal of contaminated soil in landfills is common when remediating shooting ranges.

During the last 20 years, much research have been conducted to illuminate the environmental impact of remediation operations themselves. Traditional methods of remediation like excavation and disposal or soil capping cause several secondary environmental impacts resulting from energy or material use, transport, and landfilling. A much-used method for analyzing these potential environmental impacts, are life cycle assessments (LCA). LCA takes a systems perspective that quantifies several environmental impacts associated with different stages in the life cycle of remediation project alternatives, and compares them to a common function- fulfilling a specific cleanup target.

Although LCAs is suited for systemically analyzing the environmental performance of different remediation options, the ecological impact of remediation operations are not yet quantified. This is important since many military shooting ranges are located in natural environments to ensure realistic training conditions. Both active shooting ranges in use, and closed shooting ranges provide ecological functions despite being contaminated. Traditional remediation methods can transform local ecosystems to a degraded state, whereas less invasive alternatives may have different impacts.

The main objective of Simen Kirkhorn's PhD project is to develop methods to document the ecological impact as a part of LCA, and by testing the methodology in specific case studies for military shooting range remediation.

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