



IExpE Fulmination 2023
Ordnance Munitions & Explosives

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WSRF 0004: Environmentally Sustainable Disposal of Weapons, Ordnance, Munitions and Explosives

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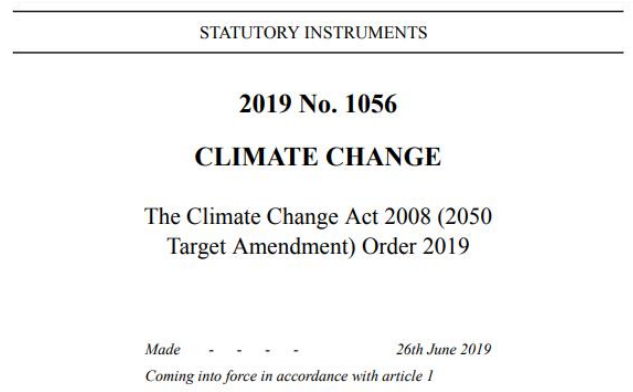
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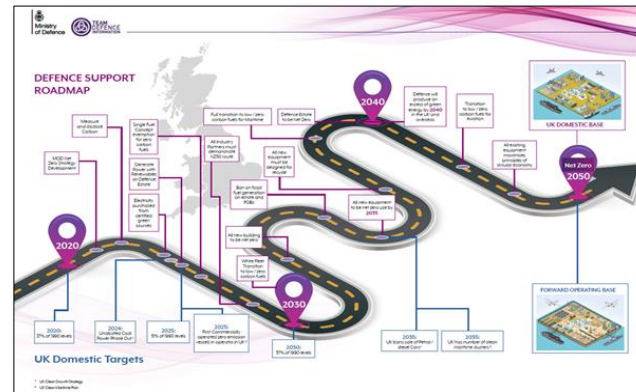
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Introduction

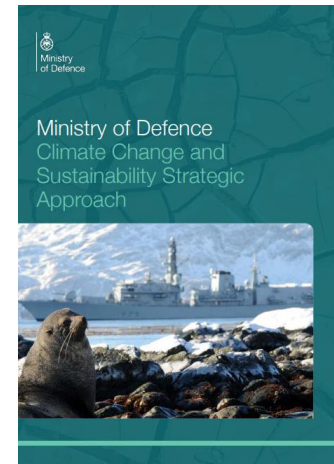
- Worldwide more than 130 countries have committed to Net Zero Carbon Emissions by 2050 (NZ50).
- In 2019, the National Audit Office reported that the Ministry of Defence (MOD) emitted approximately two thirds of the UK Government’s carbon emissions.
- The *Roadmap for Sustainable Defence Support* was published in August 2020.
- In March 2021, the UK Ministry of Defence (MOD) published its *Climate Change and Sustainability Strategic Approach*.



Ref: Snip of publicly available Climate Change Act Doc.



Ref: Snip of Roadmap from MOD Roadmap for Sustainable Defence Support Doc.



Ref: Snip of publicly available MOD climate change & sustainability strategic approach Doc.

Background

- The most common WOME disposal methods currently used in the UK include:
 - Open Burning/Open Detonation (OBOD) and cage burning.
 - 'AVOCET' incineration processes at MOD Shoeburyness.
 - Transporting overseas.
- These methods are not sustainable. They require high energy consumption or produce direct emissions to air.
- The defence community is recognising the important part decarbonising WOME disposal can play in helping the UK Government to achieve its NZ50 target.



Ref: Stock Images.



Ref: Stock Images.

Project Overview

Economically viable Sustainable Disposal options for WOME.

The aim of the programme was to:

“investigate how the UK, and overseas (particularly NATO nations), can improve WOME disposal practices to help towards achieving Net Zero targets and demonstrate compliance with regulation”.



Ministry
of Defence

[dstl] The Science Inside



WP1 Literature
review

WP2 Disposable
materials
assessment

WP3 Economic
assessment &
Roadmap

WP4 Final report

WP5 Project
management

Literature Review & Disposal Materials Assessment Summary

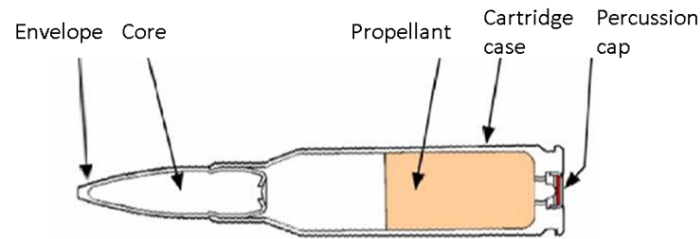


Figure 1. Schematic of a 7.62x51mm ball round. UK MOD.
Ref: Defence Munitions Publication 14 - Small Arms Ammunition. s.l. :
Defence General Munitions Project Team, 2016.

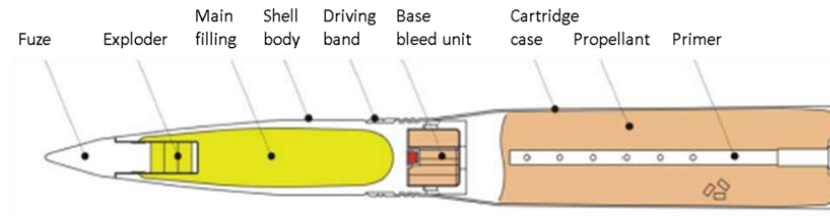


Figure 2. Schematic of a 4.5-inch Mk 8 IA HE round.
Ref: UK MOD. Defence Munitions Publication 7 - Ammunition for the 4.5 inch MK 8
Gun. s.l. : Defence General Munitions Project Team, 2011.

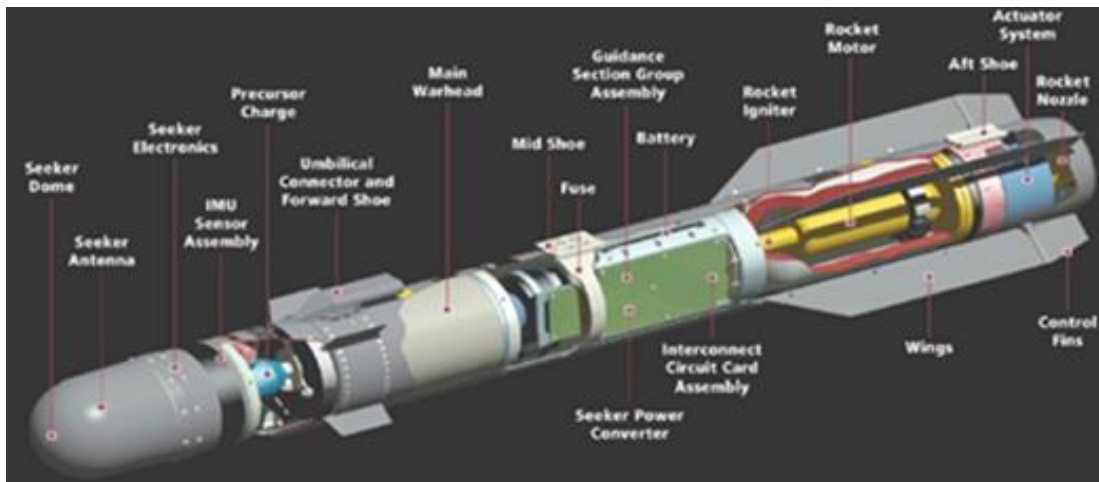


Figure 3. Publicly available schematic of the Brimstone 1 guided weapon. Ref: Think Defence.
Complex Weapons Brimstone. Think Defence. [Online] 2021
<https://www.thinkdefence.co.uk/uk-complex-weapons/brimstone/>

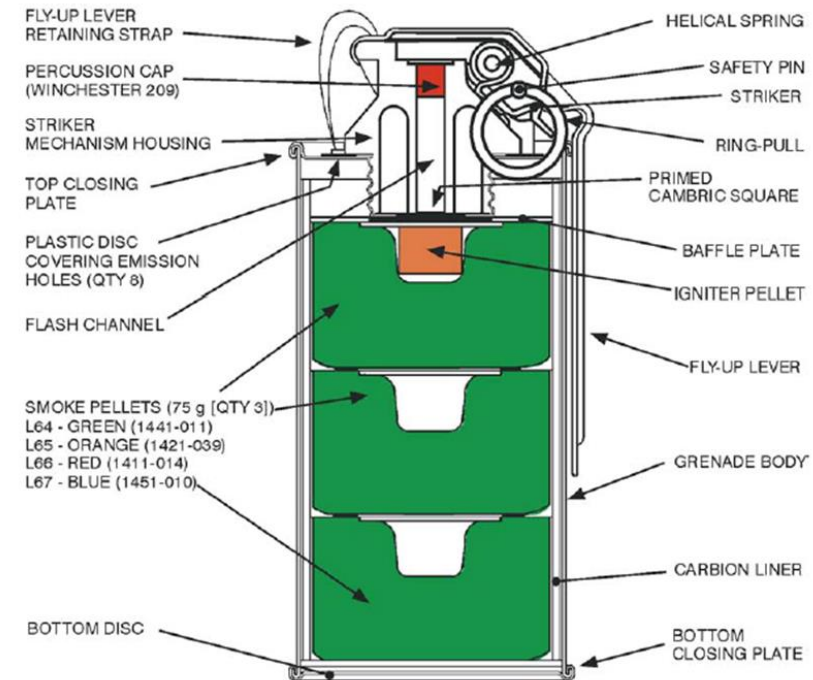
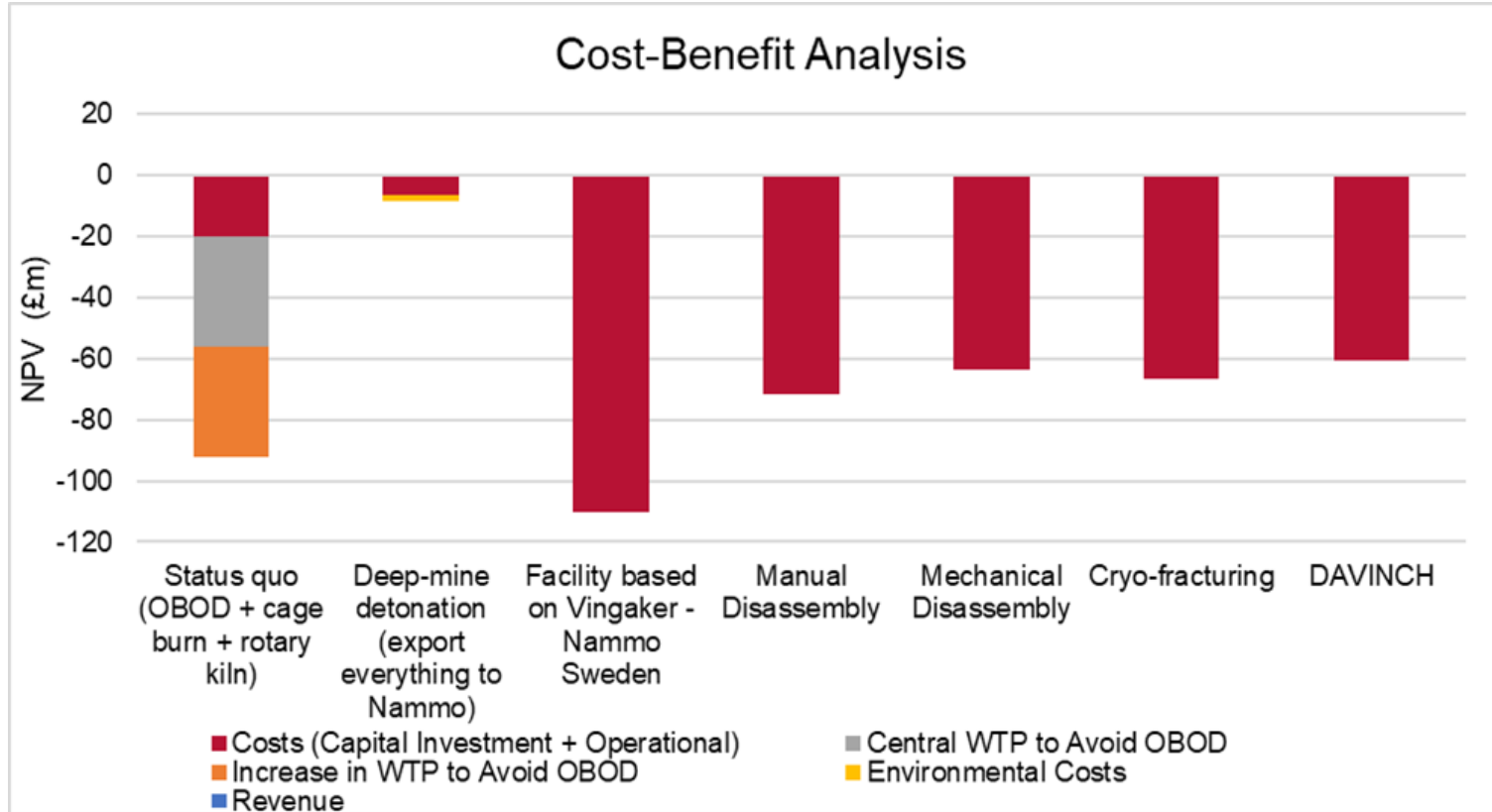


Figure 4. Schematic of an orange L65A1 signal smoke grenade.
Ref: UK MOD. Ammunition and Explosive Regulations Volume 3 Part 11 Grenade Hand Signal Smoke. 1999.

Economic assessment



Recommendations for disposal options based on each exemplar:

- **SAA** – Rotary Kiln ('AVOCET' or other types of Rotary Kiln).
- **Gun ammunition (QF fixed)** – Exporting to Nammo if transport route can be decarbonised.
- **Pyrotechnic** – Exporting to Nammo if transport route can be decarbonised.
- **Complex munition** – DAVINCH or exporting to Nammo if the transport route can be decarbonised, or build a facility in the UK similar to Nammo Vingaker site.

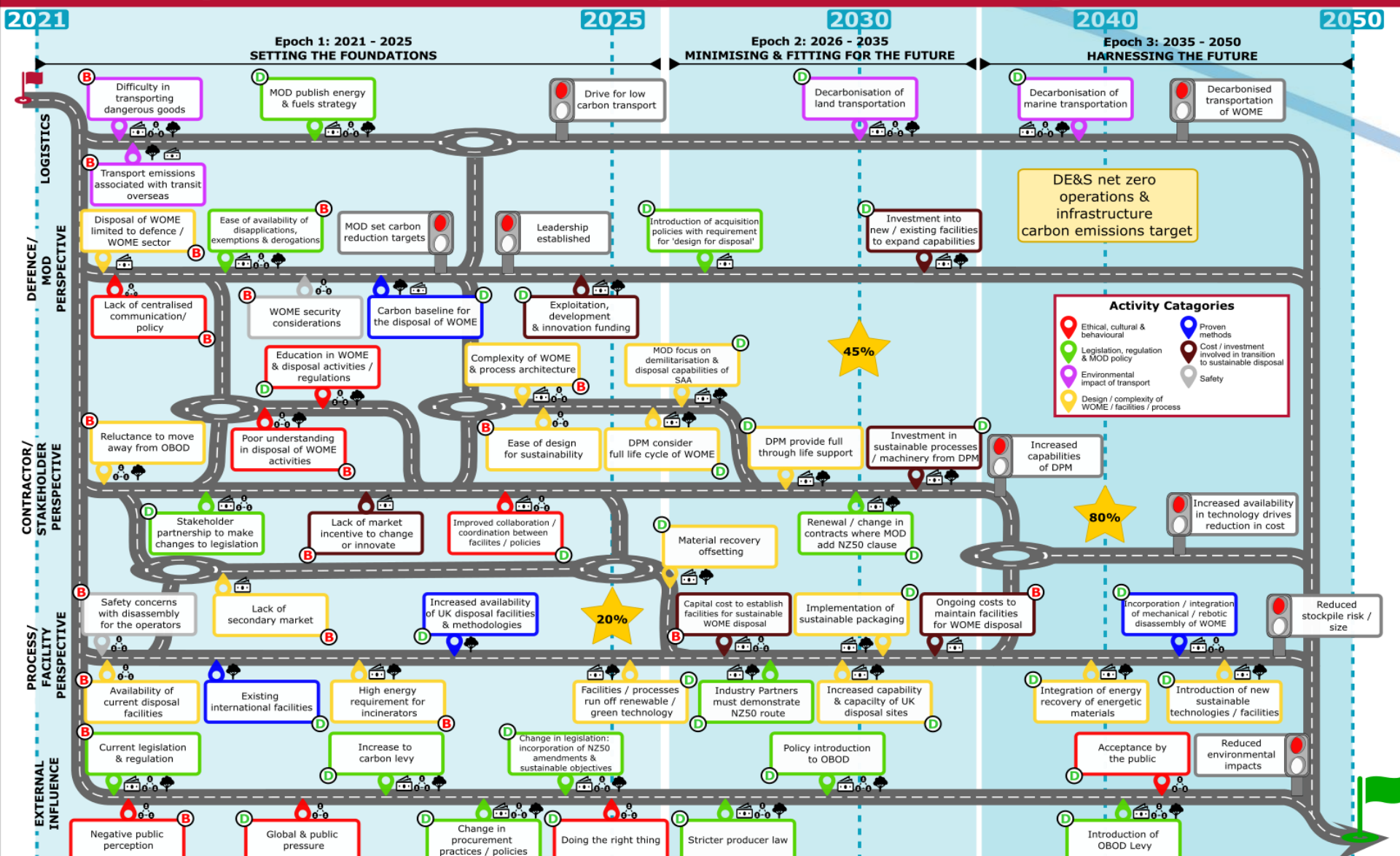
Notes:

Not all methods are applicable to all exemplars

WTP = Willingness to Pay - the maximum price a customer is willing to pay for a product or service used for behavioural economics

OBOD = Open Burning Open Detonation

Roadmap to Environmentally Sustainable Disposal of WOME



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ROADMAP KEY: Current state of disposal of WOME activities & processes; Key Milestones; Significant Barriers; Key Drivers; SBTi Targets (reduction in emissions with reference to baseline); Environmental Sustainability Pillar; Social Sustainability Pillar; Economic Sustainability Pillar; Environmentally Sustainable Disposal of WOME; OBOD: Open Buring Open Detonation; MOD: Ministry of Defence; NZ50: Net Zero Carbon by 2050; DPM: Design, Procurement & Manufacture Stakeholders; DE&S: Defence Equipment & Support; WOME: Weapons, Ordnance, Munitions & Explosives; SAA: Small Arms Ammunition; SBTi: Science Based Targets Initiative

Ref: Frazer-Nash developed roadmap diagram.

Project Findings

- The roadmap demonstrates ways for WOME disposal to move towards NZ50 and a more sustainable, circular economy.
- UK environmental legislation change and updates to MOD Policy is the biggest driver to ensure the NZ50 target is met.
- A significant commitment and capital expenditure will be required to:
 - Increase the capabilities/capacity of facilities, or to build new facilities.
 - Move away from the unsustainable status quo for WOME disposal.
 - Modify facilities, and transportation of WOME, to use more sustainable energy sources.

Recommendations



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