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Producer Involvement Conference

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Malmö, 18. April 2024

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Key data

Project name:	**IM**pacts **A**nd **R**esponse **O**ptions regarding low sulphur marine fuel oil **S**pills
Project Acronym:	IMAROS 2
Duration:	1. 1.2024- 31.12.2025
EU Co-financing:	85%
Web:	https://civil-protection-knowledge-network.europa.eu/projects/imaros-2
Call / project number:	UCPM-2023-KAPP /101140015

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Project partners

Rijkswaterstaat
Ministry of Infrastructure and Water Management

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Cedre

natural sciences .be

tm
Transport Malta

RAJAVARTIOLAITOS
GRÄNSBEVAKNINGSVÄSENDET
FINNISH BORDER GUARD

KUSTBEVAKNINGEN

Oil Spill Response

Background

- Previous tests and observations
- IMAROS project

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IMAROS project

Project name:	**I**mproving response capacities and understanding the environmental impacts of new generation low sulphur **MAR**ine fuel **O**il **S**pills
Project Acronym:	IMAROS
Project period:	**1.1.2020 – 30.6.2022**
Website:	www.kystverket.no/imaros

Objectives

- Recommendations for oil spill response involving the new generation of fuel oils
  - capacities and methods for response at sea and shorelines
  - oil spill behavior and potential environmental impacts

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Work packages

- Planning
- Meetings & workshops
- Financial management
- Reporting

WP1: Project management

- Overview of frequently encountered new 0,1 % and 0,5% S products
- Sample collection and selection for WP 3 and 4

WP2: Compilation of knowledge

- Chemical composition and physical properties:
  - Oil weathering
  - Behaviour in the environment
  - Oil spill identification
  - Modelling

WP3: Chemical characterisation

- Testing of response methods and equipment:
  - Mechanical recovery
  - Dispersants
  - *In situ* burning
  - Shoreline clean-up

WP4: Response options

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Screening of physical and chemical properties

- 13 samples collected
- 2 ULSFO / 11 VLSFO
- From 7 countries
- From oil producers, bunker deliverers and Wakashio incident
- Residual products, mostly blended
- 3 semi-solid oils at room temperature
- Screening of chemical and physical properties at CEDRE

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Results fresh oils

Sample	S content (%)	Density 5 °C	Density 15 °C	Viscosity 5 °C (mPa.s) [(1)(2)]	Viscosity 15 °C (mPa.s) [(1)]	Pour Point (°C)	Flash Point (°C)	Asph. (%) [(3)]	Waxes (%) [(3)]	Evaporation (vol.%)
IM-1	0.08	0.96	0.95	solid	solid	27	>100	0.3	17.3	3.8
IM-2	0.46	0.94	0.93	solid	solid	27	>100	0.5	12.1	5.2
IM-3	0.46	0.99	0.98	4858	1293	0	99.5	2.3	4.8	8.6
IM-4	0.48	0.95	0.95	2808	703	21	93	2.2	8.1	9.0
IM-5	0.47	0.92	0.91	1826	375	9	84	0.6	5.1	10.5
IM-6	0.45	0.98	0.97	2244	892	-27	78	3.0	7.6	28.1
IM-7	0.49	0.95	0.94	4415	19117	15	>100	1.7	6.2	6.7
IM-8	0.49	0.97	0.96	15585	3348	9	>100	1.6	9.9	15.4
IM-9	0.08	0.90	0.90	solid	solid	30	>100	1.6	20.6	21.6
IM-10	0.47	0.95	0.94	12443	2451	0	>100	3.7	9.1	2.9
IM-11	0.49	0.95	0.94	8171	1964	0	>100	3.4	9.0	2.6
IM-12	0.48	0.95	0.94	10679	3042	-9	83.5	1.8	18.6	21.4
IM-13	0.48	0.96	0.96	24994	6240	-6	77	2.3	8.7	16.9

(1) Viscosity measured with a shear rate of 100 $^{-s}$

(2) At 5 °C, the mean of the ten first values were calculated

(3) Values recalculated for the fresh oils, from the 250 °C residues, taking into account the evaporation rate at 250 °C

Viscosity (mPa.s)

	Viscosity 15°C	Viscosity 5°C
Min	375	1826
Max	6240	23985

Density

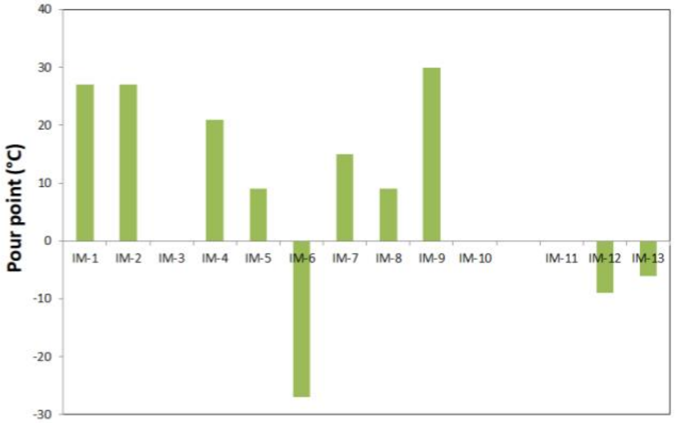
	Density 15°C	Density 5°C
Min	0.90	0.90
Max	0.98	0.99

Gasoline*: 0.65 – 0.75
HFO*: ~1.00

Pour point (°C)

	Pour point (°C)
Min	-27
Max	30

Gasoline *: -
HFO*: variable



→ Depending on the LSFO involved and on the local temperatures, behaviour can greatly differ and recovery can be challenging

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Summary of results

- High variability of the physico-chemical properties that likely reflects different ways of making VLSFO to comply with their sulphur limits
- Safety: no flammability issues expected
- Persistence at sea surface expected
- Immersion issues could occur in particular environments (freshwater,..)
- Sticky behavior or highly viscous oils can be encountered

IMAROS: Conclusions

- Great variability in the physico-chemical properties of LSFO
    - LSFO spills may show very different behavior and impacts in the environment.
    - The tested aquatic ecotoxicity is within the range observed in traditional fuel oils.
- Oil spill responders will need to be prepared for spills with a wide range of different characteristics.
    - Sticky behaviour or highly viscous oil can be encountered
    - High pourpoint and solidification of the oil is a main challenge for mechanical recovery related to some of the tested samples.
    - Penetration of some oils into the bedrock might affect shoreline clean-up.

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IMAROS: Research needs

- Efficient mechanical recovery of oils with high pour point
- Investigate further the link between the pourpoint, elasticity and wax
- Penetration of some of the oils into rocks has not been observed before, why this is happening is unknown. Consequences for shoreline clean-up?
- Further following up on the changing market trends and resulting risk picture
- Biofuels in-mix (Fame, HVO, B100 etc.) - How much biooil would go into the oil and what other additives are used?
- Visco-elastic and brittle rheologies to simulate spreading and cracking of oil slicks for VLSFO with high pour point

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Main objectives

- Improve understanding of oil spill behaviour of LSFOs, and consequently decision making on all levels of oil spill response operations
- Improve capacities of mechanical recovery and shoreline response

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Work packages

WP 1
Project management and cross-cutting

WP 2
Trends and samples

WP 3
Characterization and impacts

WP 4
Mechanical recovery

WP 5
Shoreline response

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WP 1 Project management and cross-cutting

Lead: Norwegian Coastal Administration

Participants: All partners

Duration: Month 1-24

Objectives:

- Project management
- Crosscutting activities
- Communication
- Synthesis of results from all WPs

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WP 2 Trends and samples

Lead: Rijkswaterstaat

Participants: All partners

Duration: Month 1-18

Objectives:

- Update knowledge on ship fuels in European waters
- Collect representative oil samples

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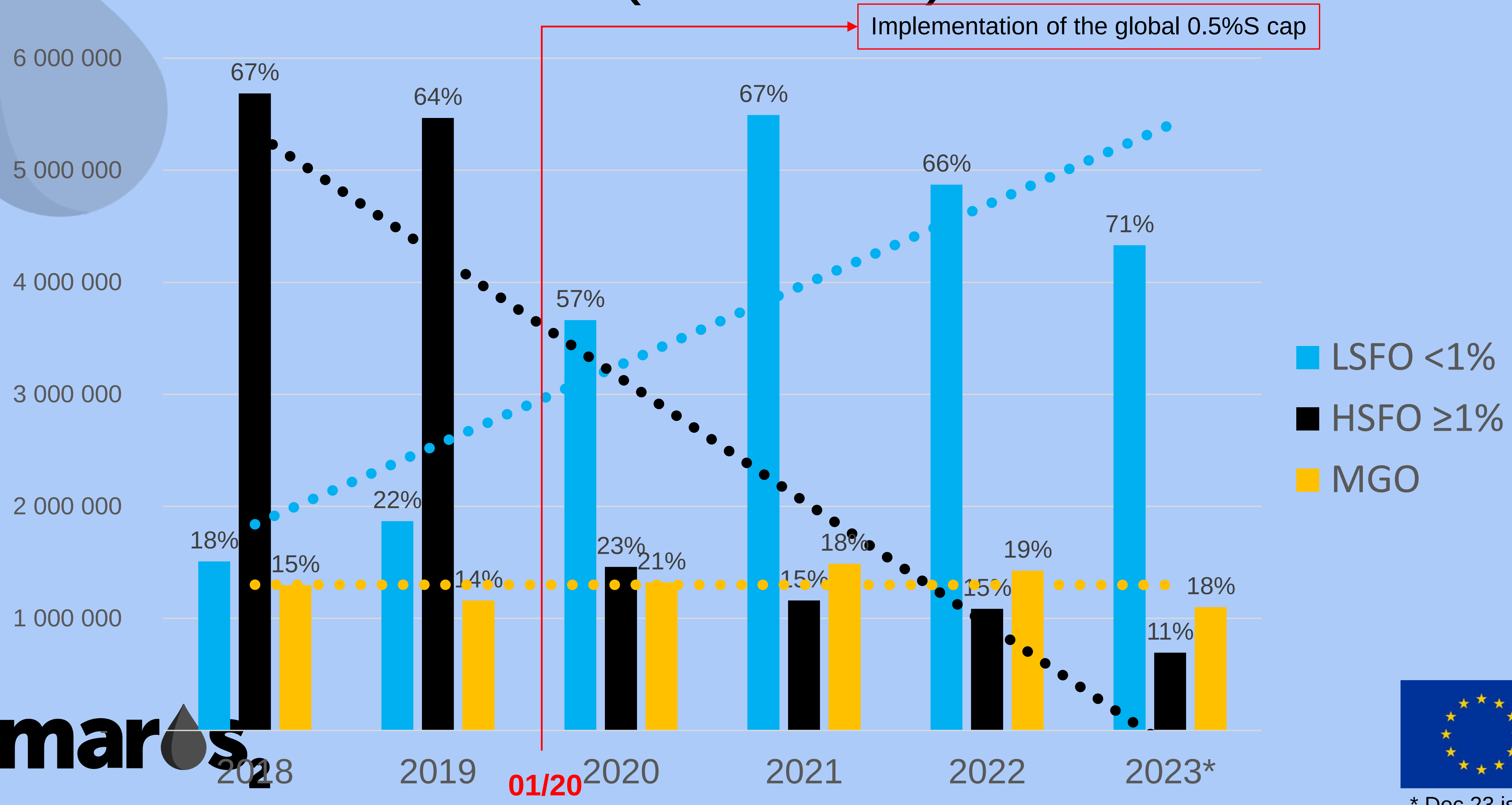
Example: Belgian Petrol Balance

- Governmental Energy monitoring by Fapetro
- Monitors and controls the quality of petroleum products marketed in Belgium
- Petrol Balance: bunkers for seagoing vessels

Totals 2018 – 2023 (in tonnes)



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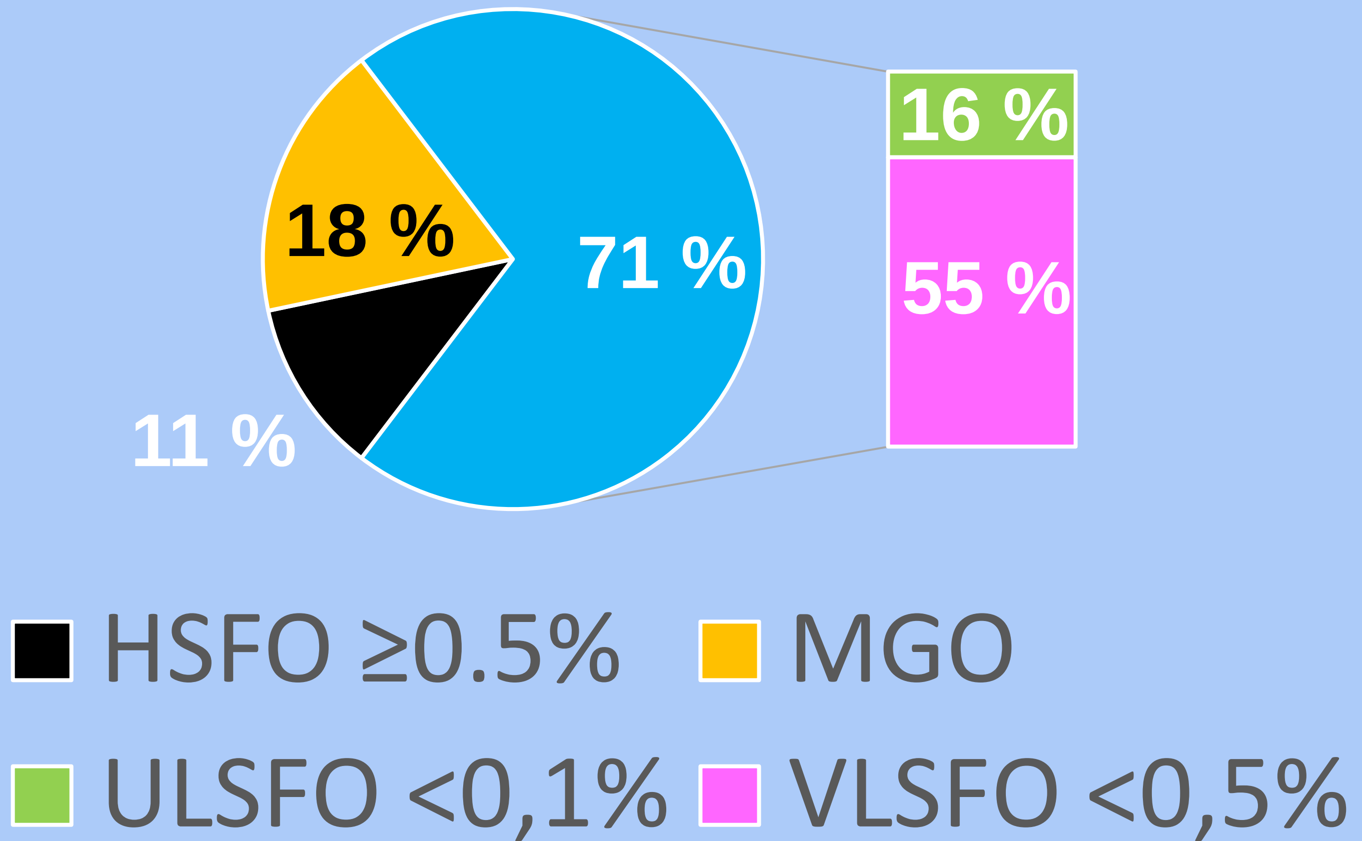
* Dec 23 is missing

Breakdown 2023



Belgian Petrol Balance

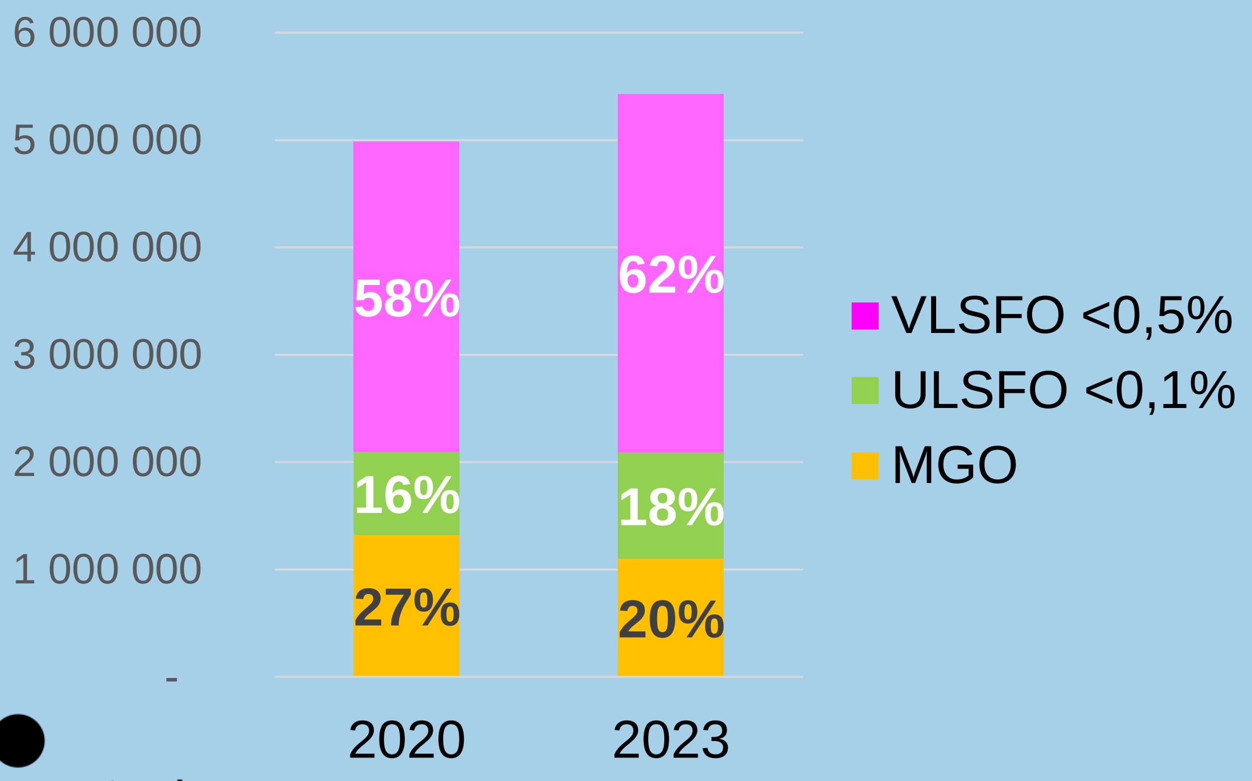
<u>Until 12/2019</u>

- HFSO (≥ 1%S)
- LSFO (< 1%S)
- MGO

<u>From 01/2020</u>

- HFSO (≥ 0,5%S)
- LSFO (< 0,5%S)
  - ULSFO (< 0,1%S)
  - VLSFO (0,1%<S<0,5%)
- MGO

Balance MGO - VLSFO – ULSFO 2020 vs 2023*



* Dec 23 is missing

WP 3 Characterization and impacts

Lead: CEDRE

Participants: Royal Belgian Institute of Natural Sciences, Rijkswaterstaat

Duration: Month 6-22

Objectives:

- Screening and characterisation of samples
- Improve understanding of properties of LSFO affecting recovery and shoreline response, including wax-components and interfacial tension
- Improve understanding of behaviour of LSFO in marine and fresh waters
- Improve understanding of behaviour and response options in the Mediterranean

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WP 4 Mechanical recovery

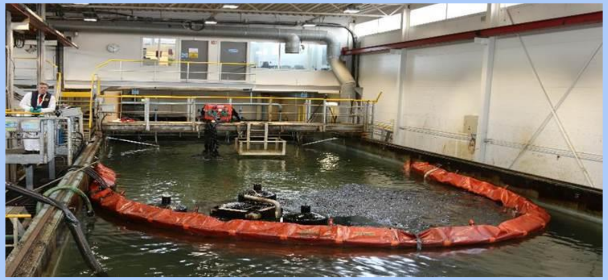
Lead: Norwegian Coastal Administration

Participants: All partners

Duration: Month 2-22

Objectives:

- Test applicability of different mechanical recovery systems to on the of LSFOs with challenging behaviour
- Promote innovation and improvement of existing equipment



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WP 4 Tasks

4.1 Manufacturer involvement and innovation

- Responsible partner: Swedish Coast Guard
  - Producer Involvement Conference
  - Invitation to participate in trials
  - Selection process for trails

4.2 Mechanical recovery trial period 1

- Responsible partner: Norwegian Coastal Administration
- Norwegian test facility
- Temperate conditions

4.3 Mechanical recovery trial period 2

- Responsible partner: Finnish Borderguard
- Finnish testfacility
- Cold / ice conditions

4.4 Mechanical recovery trial period 3

- Responsible partner: Norwegian Coastal Administration
- Norwegian test facility – part 2: Improvements
- Temperate conditions

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WP 5 Shoreline response

Lead: CEDRE

Participants: CEDRE, Norwegian Coastal Administration, Transport Malta

Duration: Month 7-23

Objectives:

- Identify possible gaps and solutions within shoreline clean-up methods and/or equipment
- Give operational recommendation by categorizing the different types of LSFO and associated response options
- Study the potential toxicity of LSFO absorbed in rocks on marine organisms

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Timeline for the project

2024

WP 1	Expert meeting 1
WP 2	Collecting samples
WP 4	Producer Conference

WP 2	Collecting samples
WP 3	Chemical characterisation
WP 4	Trial period 1

2025

WP 3	Modelling
WP 4	Trial period 2 and 3
WP 5	Work on shoreline response

WP 1	Expert meeting 2
WP 1	Categorisation of oils and operational recommendations
WP 5	Work on shoreline response

2026

01 Start up/ Workshop 1
Jan/feb 2024

02 Workshop 2
May/june 2024 (week 22)

03 Workshop 3
Jan/feb 2025

04 Workshop 4
June or sep 2025

05 Final conference
November 2025

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