Oil Pollution Levy Methodology Review

Report to Maritime NZ

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Glossary

Abbreviation	Stands for
BEC	Business Economic Council
MNZ	Maritime NZ
ML	Maritime Levy
OPL	Oil Pollution Levy
FPSO	Floating production storage and offloading
MOSRA	Marine Oil Spill Risk Assessment
Gt	Gross ton
MT	Metric tonne

Executive summary

This paper explores and evaluates options for the methodology that might be used to allocate risk to support the setting of levies for the Oil Pollution Levy (OPL). At present the share of risk in regard to a marine oil spill is determined through a complex, dynamic process using a model known as the Marine Oil Spill Risk Assessment (MOSRA). This process takes the history of vessel movements, the risk of coastline damage, the ocean currents (among other things) and assesses a risk weighting for each sector of the maritime industry who are liable for the OPL to determine the share of levy cost that is raised from that sector. The model was last extensively revised in 2016 to underpin the last full review of the OPL and then refreshed and run in 2018 (MOSRA18) for the "mid-point – three year" review. The model relies on historical data to generate sector risk shares.

Two methods of raising the OPL have been short listed based on the evaluation

Recent changes to shipping volumes (principally because of the closure of the Marsden Point refinery, and a volume history impacted by COVID disruptions), mean that the MOSRA18 sector risk allocation is no longer reflective of the state of play. The two short listed options for raising the levy in the next period; evaluated in this paper are:

- Option 1 - modified status quo: Reweight the MOSRA18 allocation by applying relative volume changes in each sector to the current weights and rebasing (with multiple sub options)
- Option 2 - apply the ML methodology to the OPL: Revise the current methodology to one that is aligned to and reflective of the ML methodology; resulting in an approach that considers the time that a metric tonne of fuel is in New Zealand coastal waters.

The preferred option is Option 2: apply the ML methodology to the OPL

Both options have their own advantages and disadvantages. Under Option One - Modified MOSRA18 – the reweighting options would have similar changes to rates; however, these rate changes would all be significant because one sector of MOSRA18 – persistent fuel deliveries by foreign tankers – which was assessed as embodying 35 percent of the total risk in 2018, has dwindled to insignificance, spreading the burden to other areas.

The second, and recommended option, is to move away from the MOSRA methodology and instead treat all marine oil (bunker fuel and cargo) in New Zealand coastal waters on a similar basis. This option will offer consistent treatment across sectors and will require minimal adjustments over time and is cost effective to implement.

The option of a new MOSRA (23) was discarded

We recommend discarding the option of rerunning MOSRA for several reasons:

- The disrupted volume history might lead to weights that are not reflective of what might occur in the period under which the review will apply
- A new MOSRA allocation would take a long time
- It is expensive to rerun the model and would require higher rates to recover those costs

- The risk profile of oil spills in New Zealand waters is now more evenly distributed with the absence of significant volumes of high-risk crude imports – leaving a major reason for operating a sophisticated risk model redundant

Model operation

Option One - the modified MOSRA option - is a "top-down" approach. The risk shares are calculated first at a high level between sectors and then a proxy for levying payment is used (e.g. gross tons of the vessel).

Option 2 is better characterised as a "bottom-up" approach. The allocation is first established on a basis that is consistent towards all oils on the water – it is neutral between vessel type, foreign/domestic, fuel as cargo, or bunker fuel. Adjustments ratios are then applied for expected time in the water (domestic registration versus a foreign port visit), area of operation in the case of vessels that do not enter the inshore, and persistent vs non persistent oil types expected.

A series of proxies are applied for the purposes of setting rates for individual vessels:

- Gross Tonnage (GT) for fuel on board
- Port visits for time spent by international vessels in NZ waters

The operation of the model relies on volume forecasting of vessel movements in order to set rates that will over the medium term raise the target revenue. This forecast is common to the ML and the recommended OPL method. We have also considered sub-options where there are potential differences in application.

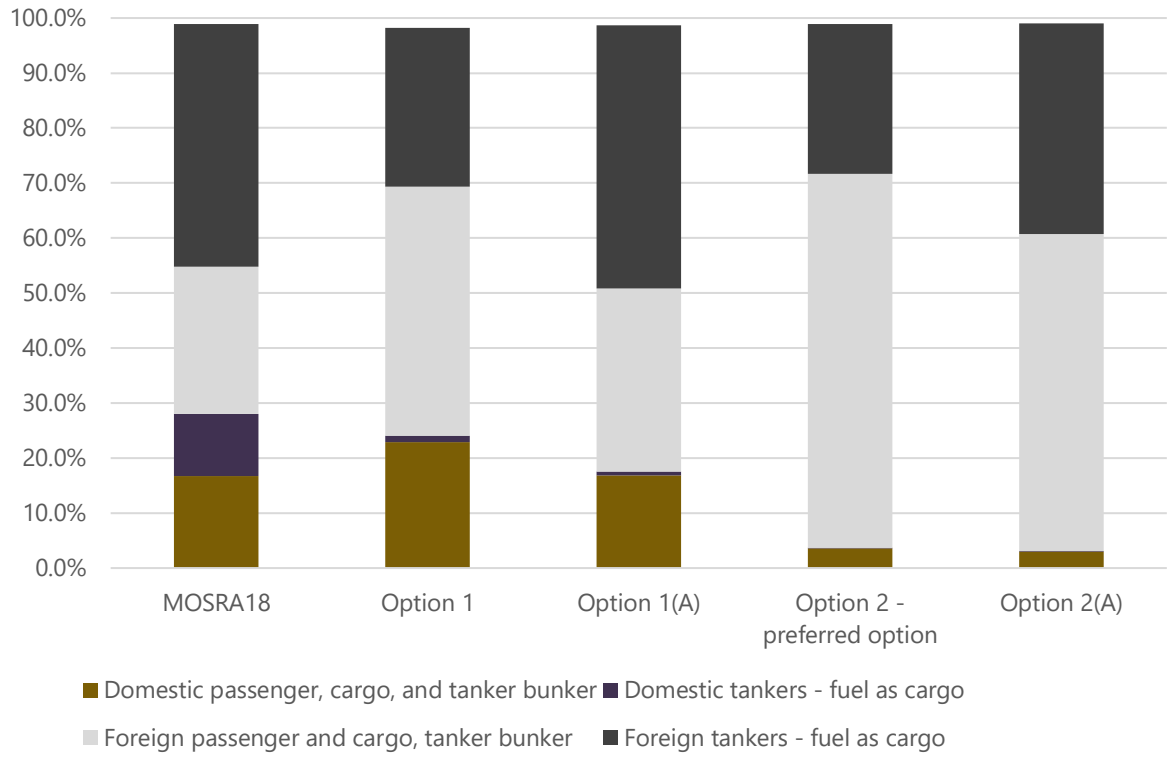
Impact of preferred model on sector share

Figure 1 shows the resulting shares paid by each sector under different models:[1]

- MOSRA 18 shows the allocation in the previous MOSRA model (Baseline)
- Option 1 (and 1A – which doesn't distinguish between persistent and non-persistent oils) show the outcome of attempting to use MOSRA 18 on current expected volumes
- Option 2 shows the outcome of applying a ML method to the OPL with a distinction between persistent and non-persistent oil
- Option 2A shows the outcome of applying a ML method to the OPL without a distinction between persistent and non-persistent (all oil treated equally)

[1] Note: figures do not sum to 100 per cent as there is a small FPSO component not displayed.

Figure 1 - Relative shares of main sectors[2]



Due to vessel activity changes arising from the closure of Marsden Point as a refinery the share of domestic tankers dwindles to insignificance by comparison with the MOSRA18 allocation. With the exception of option 1(A) the share assumed by foreign vessels with fuel as cargo reduces significantly. In the cases of options 1 and 2 the reason for this decline is the movement away from persistent oil carried as cargo.

The shares carried by domestic vessels all reduce significantly under option 2. This is because the MOSRA methodology placed significant weighting to certain sections of the coastline as opposed to others. The revised methodology is neutral as to the location of the risk in the inshore waters. Under option 2, the FPSO facility also assumes a far greater share.

[2] Note that the shares of the FPSO and the fishing vessels are not shown in this chart

1. Introduction

Since 2019 there has been a small revolution in the oil supply pattern in New Zealand which will have consequences as we forecast revenue raised from oil pollution levies out to 2030.

The change that has had the most impact is the closure of the Marsden Point Refinery in April 2022. As a result the volume of "persistent" oil imported to New Zealand has plummeted. Instead, Marsden Point has become a distribution hub for refined fuel for Northland, Auckland, and parts of Waikato. The Wiri pipeline continues to send fuel south.

Another evolution which will have enduring impact is the decoupling of economic growth and consumption of fossil fuels. Fuel consumption statistics from MBIE and forecasts published by the Business New Zealand Energy Council (BEC) support this finding.

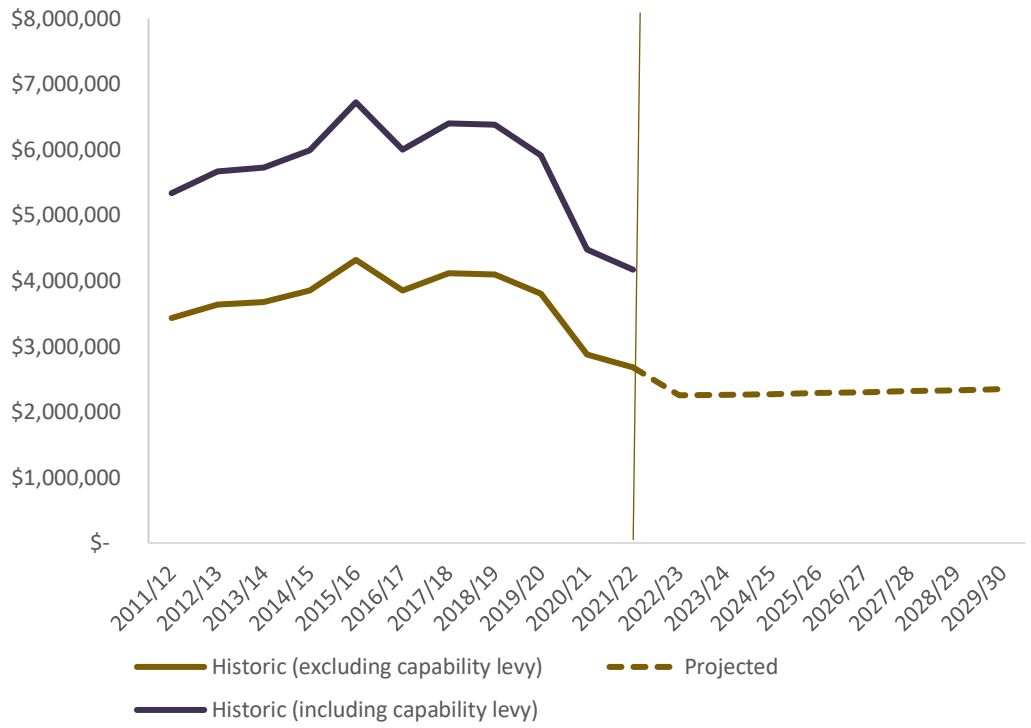
Finally, Covid has had some effects: some enduring, some temporary. Supporting the BEC forecasts are trends towards working from home following experimentation in different working practices during lockdown. Harder to predict, but also possibly enduring are changes to the way that New Zealand ports are serviced by large companies, which has resulted in lower shipping volumes as measured in gross tons since 2018/19. Finally, there have been temporary disruptions to shipping volumes in the form of cruise ships being barred from New Zealand waters until 2022, and lower demand for aviation fuel and other transport fuels particularly during the period when border restrictions were at their height.

Under the current levies regime, Maritime New Zealand (MNZ) would need to increase the levies significantly, for individual vessels, to ensure that its revenue base was protected.

Figure 2 shows the Oil Pollution Levy's annual revenue from the international vessels that would have been raised if the June 2022 levy rates had been applied to historic and projected fuel volumes and shipping gross tonnage. Historic revenue is separated into revenue excluding the capability levy and revenue including the capability levy to show the impact of the levy timing out, and of shipping volume decreases. Projected revenue does not include the capability levy as this levy timed out in June 2022.

The effect of changing volumes and timing out of the capability levy is a revenue decrease by over half. Excluding the capability revenue decrease, revenue decreases as a consequence of the shift away from persistent fuels, declining fuel consumption through the covid years, and a decrease in shipping volumes since 2018/19 for all types of vessels (cargo and cruise).

Figure 2 Annual revenue from current international levies using historic and forecast volumes



It is clear that to maintain the real value of levies raised, MNZ needs to:

- Increase the levies charged and/or
- Find a new method for applying levies.

2. Assessing alternative methods of raising levies

To test an alternative method for applying oil pollution levies we have developed four criteria for scoring purposes.

The first criterion is **equity**. What we mean by this is the extent to which shipping companies are assessed based on the risk that they are giving rise to. One might expect that if a large tanker of crude oil transiting treacherous waters near an area of high conservation or economic value might be charged more than a small cargo vessel carrying only a small amount of diesel as fuel for example.

The second criterion is **administrative simplicity**. A method that has a lower administration cost for assessing the levy will score better than one that has to consider multiple factors such as quantity of fuel carried and capacity.

The third criterion is **economic efficiency**. By this we mean that the levy regime does not give rise to uneconomic behaviour. For example, if one levy regime incentivised certain behaviours that increased the risk of an oil spill while having the same benefits as another we should prefer the latter.

And the fourth criterion is **certainty**. We are looking for a method that creates a less volatile revenue forecast for MNZ while minimising large changes in levies that are required if shipping volumes change.

There is inherently a trade-off between equity and simplicity. The simpler an option is to implement, the less granularity in levy setting mechanism. However, to aggregate and simplify the levies, fewer distinctions are made, and less equity results i.e. high risk and low risk parties are grouped together.

Option 1:

MOSRA 18 reweighted

Option 1 continues the current risk-based setting of levy rates. Total oil spill risk is estimated and attributed to sectors (e.g. foreign oil tankers accounted for 44 per cent of the risk in the 2018 Marine Oil Spill Risk Assessment.[3]). The levy is then apportioned to these sectors based on their oil spill impact assessment.

To update the weights following the closure of Marsden Point we have followed a two-step process. First, we adjusted the current weighting for each sector by a factor equivalent to the volume change (known and forecast) for that sector. E.g. we took at the percentage change in the gross tonnage of registered fishing vessels and applied that to the fishing vessel weighing of MOSRA18. Next we added up the resulting scores and reweighted them to add to 100% as shown in Table 1. The results show that there has been a reweighting towards foreign vessels (mainly as a result of domestic fuel carriers

[3] https://www.maritimenz.govt.nz/content/public/environment/documents/MOSRA-report-2018.pdf

being replaced by foreign vessels). However all sectors would see an increase in their levies mainly because of volume effects.

Table 1 Option 1 - recalculated levies (based on an $9.5m target example[4])[5]

Option 1 - MOSRA18 reweighted						
	MOSRA 18	Vol change in sector	Revised risk weighting (raw)	Revised risk as % of total	Required rates $	Change vs. previous
Domestic vessels	29.1%			25.7%		
Domestic passenger, cargo, and tanker bunker	16.7%	-16%	0.14	22.9%	11.1544	169%
Domestic tankers		-94%				
Domestic tankers - persistent	*3.1%*	*-84%*	*0.00*	*0.8%*	*0.9160*	*206%*
Domestic tankers - non-persistent	*8.3%*	*-98%*	*0.00*	*0.3%*	*0.8586*	*221%*
NZ fishing	1.1%	0%	0.01	1.7%	2.3171	215%
Foreign vessels	70.9%			74.2%		
Foreign passenger and cargo, tanker bunker	26.8%	3%	0.28	45.3%	0.0175	225%
Foreign tankers		-10%				
Foreign tanker persistent	*34.9%*	*-93%*	*0.02*	*3.9%*	*0.8541*	*136%*
Foreign tanker non-persistent	*9.2%*	*66%*	*0.15*	*25.0%*	*0.2037*	*168%*
Offshore oil and gas (FPSO)	0.02%	0%	0.0002	0.04%	3,727.46	334%
Total	100.0%		0.61	100.0%	$ 9,500,000	

Table 2 scores option 1 against the four criteria. Option 1 scores highly across the categories of equity and economic efficiency, given it (relatively) fairly allocates levies to parties with the highest risk and therefore sends out appropriate price signals. However, it is more burdensome than other methods to implement as a MOSRA process would need to be re-run in the future at some point, and is a separate process compared with an ML method whereby the same sector data generates both levies.

Table 2: Option 1 scoring

Criteria	Score
Equity	8
Administrative simplicity	6
Economic efficiency	8
Certainty	7

[4] $9.5M is the average across the first three years of the proposed period for the revised OPL (FY 2024/25 – FY 2026/27) which corresponds to Years 3, 4 and 5 of the Strategy Implementation Plan.

[5] Column explanations are as follows: Column 'MOSRA 18' states each category's MOSRA18 weightings. Column 'Vol change in sector' indicates the percentage change in each category's volume. Column 'Revised risk weighting (raw)' adjusts the MOSRA 18 weightings using volume changes. Column 'Revised risk as % of total' rescales the raw weightings proportionally to sum to 100 per cent. Column 'Required rate $' apportions the total required funding to each category using the revised risk %'s, each category's required funding is then allocated per unit of volume, i.e. GT of the vessel or tonne of persistent/non-persistent oil. Column 'Change vs previous' reports the percentage change of the estimated rates relative to existing rates.

Option 1(A):

MOSRA 18 Re-weighted with no distinction between oil types

This option does not distinguish between persistent and non-persistent oil. Levies are imposed on all port visits. A significant advantage of this method is that it is weighted heavily towards fuel carriers; given that fuel imports are a fairly stable data series compared to others it offers revenue raising certainty to MNZ and, in all likelihood, the least need to adjust rates significantly.

On the other hand this approach is less effective at matching the causer of a large impact oil spill with the levies.

Table 3: Option 1(A) calculation of levies (based on a target revenue of $9.5m)

Option 1(A) - eliminate distinction between persistent and non-persistent						
	MOSRA 18	Vol change in sector	Revised risk weighting (raw)	Revised risk as % of total	Required rates $	Change vs. previous
Domestic vessels	29.1%			18.9%		
Domestic passenger, cargo, and tanker bunker	16.7%	-16%	14.0%	16.8%	8.1862	97%
Domestic tankers	11.3%	-94%	0.6%	0.8%	0.6410	132%
Domestic tankers - persistent	*3.1%*					
Domestic tankers - non-persistent	*8.3%*					
NZ fishing	1.1%	0%	1.1%	1.3%	1.7005	131%
Foreign vessels	70.9%			81.1%		
Foreign passenger and cargo, tanker bunker	26.8%	3%	27.7%	33.2%	0.0129	138%
Foreign tankers	44.1%	-10%	39.9%	47.9%	0.3758	78%
Foreign tanker persistent	*34.9%*					
Foreign tanker non-persistent	*9.2%*					
Offshore oil and gas (FPSO)	0.02%	0.00%	0.02%	0.03%	2,735.58	219%
Total	100.0%		83.3%	100.0%	$ 9,500,000	

Table 4 suggests that option 1(A) scores well on certainty: basing the levy off fuel deliveries is the best way to achieve a certain income stream. However, this option performs poorly on equity grounds as it attributes a large share of the levy on foreign vessels carrying non-persistent fuel as cargo in excess of the actual risk posed.

Table 4: Option 1 scoring

Criteria	Score
Equity	4
Administrative simplicity	7
Economic efficiency	7
Certainty	10

Option 2:

Maritime Levy Method: Proxies used to assess risk share for sectors plus for fuel in bunkers, actuals for fuel as cargo with higher rate for persistent fuel types

Option 2's levies charge all vessels based on the fuel carried. As per the ML methodology; to determine the relationship between foreign and domestic vessels we have assumed that domestic vessels (excluding fishing vessels) are present 182.5 days of the year, whereas foreign vessels are present in New Zealand waters for 2.76 days per port visit. Bunker capacity is calculated at a rate of 0.74MT per Gt of the vessel. Thus ships are charged for bunker fuel based on bunker capacity. Cargo fuel is charged on actuals with a distinction drawn between persistent and non-persistent fuel as per the current method

Table 5 - Assumptions for option 2

Assumption	Description
Domestic vessels (non-fishing) in port	We assume that domestic vessels are active for half the year (i.e. 182.5 days). This is based on the 2018 Maritime NZ Funding Review[6].
Foreign vessels – length of time in NZ waters per port	2.76 days per vessel (based on the ratio of maritime levies raised per GT) = (NZ Solas GT rate / Foreign non-passenger GT rate) / 182.5
Bunker volume	0.074154MT/Gt vessel – based on large container ships[7] by converting gallons per Gt vessel to MTs of fuel
Impact of persistent spill versus non-persistent spill (for setting levies)	We assume that a spill of persistent fuel ill cause 1.7 times more economic cost than a spill of non-persistent fuel. We have calculated this ratio by looking at the total modelled costs for median-type events for fuel spills in a study of cost impacts in San Francisco Bay.[8]
FPSO calculation	We understand that the FPSO handles 45,000 barrels of persistent oil per day. We have converted this to 6,296MT of fuel per day, and 2,298,002MT annually. We have discounted this further on the basis that the FPSO is at some distance from the coastline and should be

[6] https://www.maritimenz.govt.nz/content/funding/documents/Funding-Review-Consultation-2018.pdf, page 23
[7] https://response.restoration.noaa.gov/about/media/how-much-oil-ship.html
[8] Estimation of potential impacts and natural resource damages of oil, D. French McCay et al. / Journal of Hazardous Materials 107 (2004) 11–25- tables 12 and 13

Assumption	Description
	treated differently. We have based this discount on the proximity of the FPSO to territorial waters so that the FPSO is charged 28 percent of what its share would be based on MT of fuel only.

In the version we are proposing different rates are levied on persistent and non-persistent fuel as cargo. We also emphasise that consistency with the maritime safety is achieved with this approach because of the gross ton per vessel per port method is used in raising funds.

Table 6: Calculation of levy – option 2 (based on target of $9.5m example)[9]

Option 2 - fuel at risk - persistent, non-persistent split								
	MOSRA 18	Unit	Days at risk/unit	Total fuel (MT)	MT/Year	Adjustment for persistent oil	New allocation	Allocation ($)
Domestic vessels	29.1%						**3.9%**	
Domestic passenger, cargo, and tanker bunker	16.7%	Annual	182.5	14,480	2,642,520	4,491,381	3.6%	$339,658
Domestic tankers		Annual	182.5		-		**0.1%**	
Domestic tankers - persistent	3.1%	*Annual*	182.5	449	82,000	139,372	0.1%	$10,540
Domestic tankers - non-persistent	8.3%	*Annual*	182.5	178	32,500	32,500	0.0%	$2,458
NZ fishing	1.1%	Annual	32.4	5,234	169,434	287,980	0.2%	$21,778
Foreign vessels	70.9%	Port	2.76				**95.2%**	
Foreign passenger and cargo, tanker bunker	26.8%	Port	2.76	18,204,524	50,220,060	85,356,963	67.9%	$6,455,064
Foreign tankers		Port	2.76					
Foreign tanker persistent	34.9%	*Port*	2.76	437,589	1,207,158	2,051,757	1.6%	$155,163
Foreign tanker non-persistent	9.2%	*Port*	2.76	11,663,619	32,175,938	32,175,938	25.6%	$2,433,284
Offshore oil and gas (FPSO) - persistent	0.02%	Annual	365	6,296	2,298,002	1,085,037	**0.9%**	$82,055
Total	100.0%				88,827,613	125,620,928	100.0%	$ 9,500,000

Table 7 shows Option 2's scoring against the criteria. Option 2 scores reasonably for equity, administrative simplicity, and economic efficiency, though lower for certainty. Although the levy rates are largely equitable and efficient (with the higher risk fuel tankers being charged more, relative to all other vessels). However, there are issues in that there are contestable assumptions made in formulating the underlying rates (e.g. capacity of fuel bunkers).

Table 7: Option 2 scoring

Criteria	Score
Equity	8
Administrative simplicity	8
Economic efficiency	8
Certainty	6

[9] Column explanations are as follows: Column 'MOSRA 18' reports each category's MOSRA 18 weightings. Column 'Unit/event' reports how each vessel category is levied. Column 'Days at risk/unit' reports the days each vessel category is active in New Zealand waters in a year. Column 'Total Fuel (MT)' reports the metric tonnes of fuel each vessel category holds in total. Column "MT/Year" multiplies the previous two columns to report the risk posed by each vessel category (and oil type) in a year. "Adjustment for persistent oil" inflates the persistent oil figures to account for the increased environmental risk posed by persistent oil. Column 'New allocation' reports each vessel category's share of the total risk posed using its proportion of the total risk. Column 'Allocation ($)' reports each vessel category's share of MNZ's total funding requirements, using the allocation of risk and total funding requirement. The required rates (MT) are the amounts to charge per MT of each fuel type.

Option 2(A):

Maritime Levy Method – All fuel is assessed for the levy via proxies – No distinction between oil types

Under Option 2(A) we simplify further by removing any distinction between persistent and non-persistent fuels for oil as cargo. The main advantage of this is administrative simplicity. It also recognises that, given demand patterns, and the tiny share of the levy compared to the total value of the fuel, that there is unlikely to be much change in behaviour.

As a matter of principle, however, it is a less equitable method of applying a levy given the greater impact of a spill of non-persistent oil. There is an argument, too, at the margins that differentiated rates may help incentivise the use of non-persistent bunker fuel.

Table 8: Calculation of levy – option 2(A) (based on a target of $9.5m example)

Option 2(A) - fuel at risk no distinction between fuel types							
	MOSRA 18	Unit/event	Days at risk/unit	Total fuel (MT)	MT/Year	New allocation	Allocation ($)
Domestic vessels	29.1%					**3.4%**	
Domestic passenger, cargo, and tanker bunker	16.7%	Annual	182.50	14,480	2,642,520	3.0%	287,995
Domestic tankers		Annual	182.50	627	114,500	0.1%	12,479
Domestic tankers - persistent	*3.1%*	*Annual*					
Domestic tankers - non-persistent	*8.3%*	*Annual*					
NZ fishing	1.1%	Annual	32.37	5,234	169,434	0.2%	18,466
Foreign vessels	70.9%	Port				**95.9%**	
Foreign passenger and cargo, tanker bunker	26.8%	Port	2.759	18,204,524	50,220,060	57.6%	5,473,231
Foreign tankers		Port	2.759	12,101,208	33,383,097	38.3%	3,638,255
Foreign tanker persistent	*34.9%*	*Port*					
Foreign tanker non-persistent	*9.2%*	*Port*					
Offshore oil and gas (FPSO)	0.02%	Annual	365	6,296	638,385	0.7%	69,574
Total	100.0%				87,167,996	100.0%	9,500,000

Table 7 scores Option 2(A) against the four criteria. Option 2 scores relatively highly on administrative simplicity but less well on equity.

Table 9: Option 3B scoring

Criteria	Score
Equity	6
Administrative simplicity	9
Economic efficiency	8
Certainty	6

3. Other options

Table 10 below summarises the list of options. We also considered a further refinement where ships would be charged at the first port of entry only, but we found that this method did not present significant advantages.

Table 10: Long list of options

Option	Description	Oil as cargo	Oil as fuel
Option 1 – MOSRA18 reweighted	Different rates for persistent and non-persistent oil delivered to each port; gross tonnage for all vessels. Assessments for each vessel category are based on a sophisticated risk assessment model	MT per port, including persistent and non-persistent	Gross tonne (Gt) vessel
Option 1 – suboption A	Same as option 1 but remove distinction between persistent and non-persistent	MT	Gt vessel
Option 1 – suboption B	Consider Gt vessel only	N/A	Gt vessel
Option 1 – suboption C	Charge tankers based on capacity rather than on fuel as cargo	Tanker capacity	Gt vessel
Option 1 – suboption D	Per tanker single charge (regardless of size); Gt vessel	Per tanker	Gt vessel
Option 1 – suboption E	Per tanker single charge; single charge all vessels	Per tanker	Per vessel
Option 1 – suboption F	Single vessel charge	N/A	Per vessel
Option 2	Introduce a uniform rate for domestic and foreign vessels that is neutral on the type of fuel and how it is carried	MT per estimated days in NZ waters	Estimated fuel in bunker (MT) using GT as a proxy per days in NZ waters

4. Evaluating the options

For each option, we provide the estimated revenue over time and a score based on the four criteria in section 2 and propose a shortlist of four options

A summary of our options analysis is provided in Table 11.

Table 11: Summary of options analysis

	Equity	Administrative simplicity	Economic efficiency	Certainty	Shortlisted
Option 1	8	6	8	7	Yes
Option 1(A)	4	7	7	10	Yes
Option 1(B)	9	6	8	5	No
Option 1(C)	6	7	6	8	No
Option 1(D)	5	8	5	9	No
Option 1(E)	5	9	5	8	No
Option 1(F)	4	9	4	5	No
Option 2	8	8	8	6	Yes
Option 2(A)	6	9	8	6	Yes

The options are assessed against the four criteria using a mix of quantitative and qualitative analysis. Scores range from one to 10, with one being the lowest rating and 10 being the highest.

- For equity, we assign options a rating based on judgement.
- For administrative simplicity, ratings are based on the expected administrative burden of each option.
- For economic efficiency, we assign a rating using expert judgement to assess whether the resulting incentives are economically efficient.
- For certainty, we estimate the standard deviation of the estimated levies from 2011/12 to 2029/30 and rank from lowest to highest.

All costs are reported in 2022 dollars.

Methods that use fuel as cargo as a predominant source of the levies will result in less variability of revenue for the reason that underlying demand for fuel moves around less than other data series such as cruise ship visits and other cargo.

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