Summary

The introduction of Market Based Measures (MBMs) to reduce the CO_2 emissions of international sea shipping will have relatively limited economic effects for the Netherlands. Moreover, these effects are largely in line with those in other countries. For the Netherlands, however, the manner in which MBMS are organised and enforced is likely to be particularly important, given the importance of ports to the Dutch economy, the country's relatively large bunker sector, and the fact that Dutch shipowners operate relatively small vessels and on a relatively small scale. MBMs include pricing measures in the form of tax or trade systems, as well as other market-related proposals. In this research study, the KiM Netherlands Institute for Transport Policy Analysis and CE Delft analysed the consequences that four international MBM proposals would have for the Netherlands.

Research purpose and structure

The International Maritime Organization (IMO), the UN organisation for shipping, is currently considering the introduction of Market Based Measures (MBMs) aimed at reducing CO_2 emissions within the international shipping sector. The EU, as part of the reduction targets it has set for 2020 (the '20-20-20' target), also wants to see a contribution from the sea shipping sector. The EU prefers global measures in the IMO framework. MBMs include measures that apply pricing to CO_2 emissions, particularly via CO_2 emissions trading and taxes. Moreover, MBMs also include other market-related proposals focusing on various types of efficiency improvements in the operational management of companies.

The Netherlands' official position regarding which measure deserves priority is still in development. Consequently, the Ministry of Infrastructure and the Environment (IenM) wants to gain a firmer grasp of all the possible consequences these various measures pose for the Netherlands and the extent to which these consequences may differ from those in other countries.

Consequences of introducing MBMs in shipping

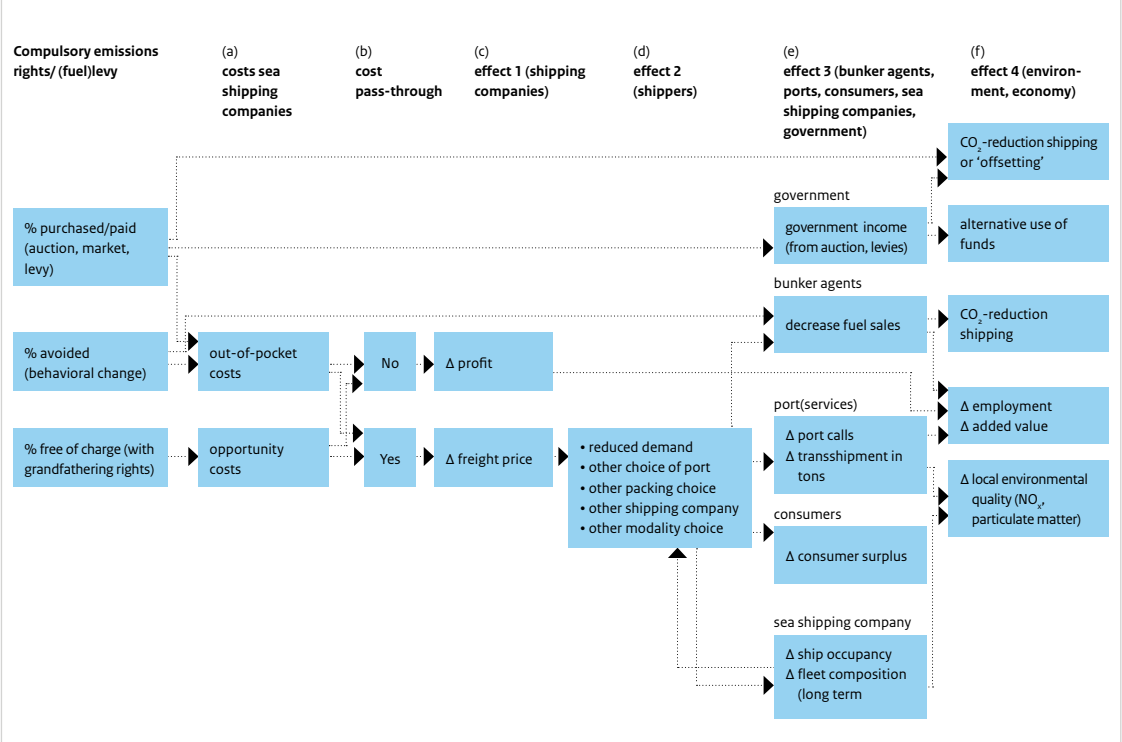
MBMs result in various behavioural responses that contribute to the intended aims of emissions reduction. MBMs however can result in price increases, which can have consequences for the shipping and port sectors' business operations, as well as having indirect consequences for all companies and consumers that use these services. Based on the two primary types of MBMs - an emissions trading system and an emissions tax –, we have determined which chains of effect would occur if these measures were introduced.

For both the emissions trading system and emissions tax, the concerned parties can partially avoid having to purchase additional emissions rights or pay the tax by reducing their own emissions themselves (behavioural change). However, in doing so, implementing the requisite technological or operational measures often results in additional costs. For example, to retrofit energy-saving technologies in ships, to purchase new, more fuel-efficient ships, or to switch to alternative fuel types that result in lower emissions. For more fuel-efficient ships, the fuel costs decrease, while for alternative fuel types this need not be the case. For behavioural change, at issue are the measures which are unprofitable under current market conditions (otherwise the concerned parties would also already have implemented those measures), but become profitable in the new situation because the costs of emission taxes or emission rights can be prevented. An exception to this is a situation in which the costs and benefits of the measure are not incurred by the same party – here we speak of a 'split incentive' -, whereby a profitable measure will not be implemented.

There are costs associated with the purchasing of emissions rights, the paying of emissions taxes and with behavioural change in order to reduce emissions. This is also the case when (a part of) the emissions rights are acquired free of charge (*grandfathering*). This free acquisition of rights indeed represents a value that can be traded. This value represents the so-called *opportunity costs*.

If sea shipping companies pass these additional costs on to their clients, a chain reaction occurs for other maritime sectors, and for shippers. Figure S.1 presents these chain reactions schematically and simplified.

Figure S.1 Chain reaction effects of MBMs



Shippers can for example opt to transport less freight or no freight at all, to use the services of another sea shipping company offering lower freight rates, to transport goods via an alternative route (shorter, slower sailing speeds), and so forth. The choice that the shipper ultimately makes is dependent on his price sensitivity.

The change in shippers' demand in turn has carryon effects for the marine fuel bunker agents, the port authorities and port services, as well as for the consumers of the goods. Shipping companies can also react to the demand response of shippers by for example cancelling voyages or bundling goods, by adjusting ship occupancy rates and sailing frequencies, by offering larger freight supplies, or altering the fleet composition over the long term (for instance smaller ships, more container ships, and so forth). These reactions can in turn lead to new demand responses among shippers. These reactions and changes in demand for ports and port services will also have economic effects in other sectors. These can also be positive, such as for the ship building sector and supervisory companies.

The taxes and trade system for CO_2 emissions reduction can also generate income for the government. Depending on how the funds are spent – are they allocated to a general fund or to a fund that pays for the emissions reductions –, there can be additional effects on emissions reduction.

The researched MBM proposals

There are various international proposals for MBMs. Four proposals were closely analysed in order to determine their effects. These proposals were selected based on differences in the designs of the measures and the expected differences in effects.

- *The Marine Emissions Trading System (METS) proposal from Norway.* The most important METS instrument is the pricing of shipping emissions via a cap and the auctioning of emissions rights. A cap is the agreed amount of emissions rights assigned to the sector; the sector can then purchase these rights at an auction. The IMO has not yet discussed the size of the cap, let alone set a cap. The emission rights are open to trading between companies. If sea shipping companies emit more emissions than the cap allows, the sector can then purchase the shortage of emission rights outside of the sea shipping sector. This is called *offsetting*; the purchased rights are called *offsets*. The amount of emissions is determined based on fuel use. The sea shipping companies may also make use of *offsets* if they have not yet purchased all the emission rights that are for sale via the auction. This is an attractive option when *offsets* are less expensive than the auction price or the price of the sector's own emissions rights. The METS proposal leaves open the possibility that part of the rights will be given free of charge, in which case the sector can also resolve a shortage in emissions rights by purchasing offsets.
- *The Greenhouse Gas (GHG) Fund proposal from Denmark and other countries.* This proposal does not tax emissions but rather fuel use, via a levy on fuel purchases: the so-called GHG Fund contribution. The contributions to the GHG Fund are used to purchase offsets for emissions that are above the predetermined reduction target established for the sector. Who is to manage this fund has not yet been determined. The size of the contribution is adjusted as needed to ensure that there is sufficient income for purchasing the required amount of offsets: this is in contrast to METS, in which the sector needs emission rights (whether or not in the form of offsets) for *all* emissions, and therefore must incur costs.
- *The Ship Efficiency and Credit Trading (SECT) proposal from the USA.* The SECT proposal establishes a reduction target per ship, rather than a sector-wide target, such as in the GHG Fund proposal. This target is coupled with the Energy Efficiency Design Index for ships. Ships that meet these technological standards receive credits that can be sold within the sector to the owners or operators of ships that have a too high index value.
- *The proposal from the Bahamas.* This proposal links the CO_2 reduction standards for maritime shipping to the age of the ship. As with the USA proposal, the Bahamas proposal is focused on a reduction target per ship, which encourages the commissioning of newer and hence more efficient ships.

Because the precise interpretation of these proposals is not yet known, in this research study we have used two offset pricing scenarios for the METS and GHG Fund proposals. This was done in order to quantitatively estimate the influence of these two MBMs. For the Bahamas and SECT proposals, the description of the consequences remains qualitative. Their influence on the cost of and demand for maritime shipping cannot be estimated without information pertaining to the proposals' objectives. Nevertheless, even if the measures' exact designs were known, it remains difficult, given the various societal effects, to arrive at a clear and comprehensive understanding of the impacts of these measures.

Consequences for the Netherlands of implementing MBMs

In consultation with the Ministry of Infrastructure and the Environment (the commissioning authority for this study), a number of aspects were selected in which the consequences of the four MBMs were mapped. At issue is a combination of indicators for the most important environmental and economic consequences, as well as the MBMs' governance aspects. A key consideration in selecting the indicators was not only arriving at useful insights into the possible effects of the MBMs, but also the question of whether, based on these points, the situation in the Netherlands could differ from that in other countries. Table S.1 provides a summary of the consequences of the four MBMs as based on the researched aspects.

Table S.1 Consequences of MBMs for the environment, economy and governance aspects

			METS	GHG Fund	SECT[1]	Bahamas[1]
1. Environmental importance	Emission reduction potential		Within the sector: 40 to 60% in 2050 compared to *business-as-usual* (BAU) Outside the sector: no maximum (thereby each emission objective is attainable)		Within the sector: 5 to 30% in 2050 compared to BAU. This means at maximum a limiting of the *increase* of emissions Outside the sector: n.a.	Within the sector: 40 to 60% in 2050 compared to BAU. This means at maximum constant emissions Outside the sector: n.a.
	Certainty of achieving emission reduction objective		Most certain	Reasonably certain	The efficiency objective is certain, but, owing to changes in the activities and size of the fleet, there is no certainty regarding the emissions objective	
	Cost-effectiveness (from social perspective)		Most cost-effective	Less cost-effective than METS, because part of the more inexpensive reduction options for sea shipping remain unexploited	Less cost-effective than METS, because only the technological (and not the operational) measures are deployed, and there is no limitation of demand	Less cost-effective than METS. Relationship compared to SECT unknown
	Local air quality		Minor positive effects due to more fuel-efficient sea shipping and possibly cleaner fuel (can be limited by use of offsets in METS and GHG Fund)			
2. Economic importance	Impact on sea shipping costs		+0.9 to +4.4%[2]	+0.5 to +2.6%[2,3]	Unquantifiable. Costs could increase as well as decrease	
	Change in demand	Sea shipping	Maximum -0.1 to -0.6%[2]	Maximum -0.1 to -0.4%[2,3]	Limited but unquantifiable	
		Rail and road (modal shift)	+0.0% to +0.2%[2]	+0.0% to +0.1%[2,3]		
		Port transhipment	Increase in transhipment of sea shipping on short sea shipping			
		Bunker suppliers	Maximum -0.1 to -0.6%[2]	Maximum -0.1 to -0.4%[2,3]		
	Economic effects for sea shipping sector (added value and employment)		Maximum -0.1 to -0.6%[2]	Maximum -0.1 to -0.4%[2,3]		
	Economic effects for port sector (added value and employment)		Maximum -0.1 to -0.6%[2]	Maximum -0.1 to -0.4%[2,3]	Unknown	
3. Governance	Administrative burdens. Extent in which MBMs result in additional administration costs		A few percentage points of the income of the tax or trade systems, primarily due to monitoring and reporting			
	Enforceability. To what extent can the system correct differences in enforcement levels?		Good	Limited when fuel suppliers are responsible for providing the financial contributions, otherwise good	Good	
	Allocation of funds		Income by auction. Expenditure possibly to compensate developing countries, which can distort the market	Income only if the contribution is larger than required for purchasing offsets. Expenditure possibly to compensate developing countries, which can distort the market	N.A.	

Based on a literature analysis, and with regard to the *business as usual* scenario, we estimate that in 2050 the METS and GHG Fund proposals can achieve a CO_2 reduction of approximately 40-60% in the shipping sector, plus the effects of offsets (which occur in other sectors). The reduction in the Bahamas proposal is comparable, but without the effects of offsetting. According to estimates, the SECT proposal from the USA can achieve a maximum CO_2 reduction of around 5 to 30%. This all based on the assumption that the MBMs will be so strict as to result in the implementation of all eligible measures. With the use of offsetting, in principle every desired emissions objective can be achieved.

For the sector as a whole, the MBMs' economic effects for the Netherlands are limited. This conclusion is in agreement with other research studies into the economic impacts of MBMs. New to this study however is that the limited effects of a large number of aspects have been established in detail. Because our starting point in this study was the simplifying assumption that all extra costs are passed on to the shippers and that - based on price elasticity - all economic effects relate to cost increases in the same manner, the estimated magnitude of the effects often involves the same percentage.

The estimate of economic effects depends strongly on the offset price and elasticity of the demand for sea shipping. Both factors are uncertain. The uncertainty in the offset price was included in the analysis by means of working with two offset price scenarios: USD 10 and USD 50 per ton CO_2. In both scenarios the offset price is significantly higher than the current offset price (less than USD 1 per ton CO_2). If the CO_2 price is lower, the economic effects of the researched MBMs are smaller or equal, but not larger. The price elasticity of the demand for sea shipping is a point estimation. If this figure is twice as much as estimated based on the available literature, the effects on port calls, employment, and the added value of shipping and the port sector should also be doubled.

An important footnote to these findings is that the calculations concern an average for the sector as a whole. For individual companies, the consequences of MBMs can be more significant. For example, this is the case for smaller companies confronted with comparatively heavy administrative burdens or for companies whose ships are comparatively less fuel-efficient.

Key considerations for the Netherlands' position

In most cases the effects for the Netherlands are comparable to those for other countries. In some instances however the consequences for the Netherlands are comparatively greater, and this is particularly the case for indicators that involve the organisation and enforcement of the system:

1. Administrative burdens. The Netherlands runs the risk of having to spend relatively substantial sums on monitoring, reporting and verification. This is due to the fact that administrative burdens frequently have economies of scale, while Dutch sea shipping companies are often minor emitters and also operate smaller than average-sized ships.
2. Enforcement. If the enforcement is not carried out by both the flag states and the port states, this increases the risk of circumventing the system. The Netherlands has a comparatively large bunker sector. The risk for the Netherlands is primarily that bunker suppliers in other countries will not contribute to the GHG Fund, while the system in the Netherlands will be strictly enforced. This can weaken the competitive position of the bunker suppliers based in the Port of Rotterdam. In general, however, IMO regulations have been strictly enforced (globally), and consequently there is a low probability of the above-described situation occurring.

Each of these risks can be obviated with regulations. For minor emitters, the administrative burdens could be limited if they impose less stringent requirements for monitoring, reporting and verification, for example. Enforcement procedures can be bolstered by giving the flag and port states a clearer role in the GHG Fund, whereby the fuel suppliers are responsible for providing the financial contributions to the Fund.