

The Norwegian NOx Fund

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As the shipping industry begins to move towards long-term sustainability, the Norwegian NOx Fund provides an example of a successful emissions reduction incentive scheme. This note details how it works and what the Fund has achieved so far, highlighting the potential benefits of operating a similar scheme in the UK and internationally for shipping greenhouse gases.

Key Findings

- Since the 2008 creation of the NOx Fund, Norwegian nitrogen oxide (NOx) emissions have decreased by 44,000 tonnes.
- The Fund has paid out over NOK 4 billion (US \$467 million) in support of NOx reductions, with Norwegian companies leading the world in this field.
- The Fund has received over 1,000 applications from business members requesting support for NOx reduction measures and technologies.
- This is a model that the UK should consider implementing to tackle greenhouse gas emissions from UK shipping as part of its Maritime 2050 strategy.
- The International Maritime Organisation should consider creating a similar fund to support research, development and deployment of zero carbon technologies across the world fleet.

Why the Norwegian NOx Fund?

In order to reduce nitrogen oxide (NOx) emissions, Norway imposed a NOx tax in 2008. Businesses had the option of not paying the tax if they committed to reduce NOx emissions by a certain amount. Thus, Norwegian businesses founded the NOx Fund – allowing the businesses to pay into the fund at a lower rate than the tax, but with the collected money used for NOx emission reduction measures. If the businesses do not reach the agreed reductions, then the tax would be re-imposed. To date, the emissions reduction measures have been successful at reaching their target.

The concept of paying a smaller fee to the Fund in place of the larger NOx tax is attractive to businesses from various industries. The fee per kg of NOx has driven businesses to find cost effective ways to reduce their NOx emissions and the ability to request up to 80 percent of the investment costs for less cost-effective measures has spurred investments that would not otherwise have happened.

As the UK (and other countries) look to reduce carbon emissions from shipping, the NOx Fund could be a model to consider. It allows money to be recycled into emissions reduction technologies within the industry by providing a

pot of money to be used to purchase green technologies that would not have otherwise been bought. The UK could easily impose a low fee on vessels in UK waters, for journeys to the UK and/or UK flagged vessels that would create a pot of money to fund low carbon technologies for shipping. In addition, it is an interesting model for the International Maritime Organisation, as it illustrates how a small price on emissions can stay within the sector and drive emissions reductions that would otherwise not happen.

Background to the NOx Fund

NOx is a chemical compound that is responsible for smog and poor air quality. NOx emissions also contribute to acid rain and formation of ground-level ozone that can damage ecosystems, animal and plant life.

As NOx emissions are an international issue, the [Gothenburg Protocol](#) was adopted in 1999. It originally set out maximum national NOx emissions for 2010-2020 but has subsequently been amended to beyond 2020. Parties to the Protocol include Norway, European Union members including the UK, and the United States. Under the Protocol, Norway is obliged to reduce its annual NOx emissions by 23 percent by 2020 compared to 2005 levels.

To meet its commitments under the Protocol, Norway introduced the NOx tax in 2007 at NOK 15 per kilogram (kg) of NOx (approximately US \$2.56 per kg based on a 2007 comparison). The Norwegian Tax Directorate's Excise Tax Round determines what taxable NOx emissions are and how taxable emissions are calculated. For shipping, the tax covers emissions from vessels within

Norwegian territorial waters and Norwegian flagged ships (even if part of the voyage takes part outside Norwegian waters).

Many in the oil industry found the tax rate unnecessarily high and suggested creating a NOx Fund instead. The idea was to pay an amount of money, lower than the original tax, to the Fund that would be then used to finance NOx reduction measures. After several negotiations with authorities, the Ministry of Climate and Environment and 14 business organisations signed a NOx Agreement, entering into force on 1 January 2008. The business organisations included the Federations of Norwegian Coastal Shipping and Aviation Industries, among others.

Norwegian NOx emissions stem mainly from energy production, road traffic and shipping. In 2005, the Norwegian Directorate of the Environment conducted an analysis for NOx comparing the cost of NOx reduction measures across different industries. This showed a large spread in the cost of NOx reduction measures within various industries but with some of the most cost-effective measures existing in shipping, where the absolute reduction potential was also the greatest. Shipping has such a large potential because vessels can switch to fuels with much lower NOx emissions such as liquid natural gas (LNG) or introduce technologies to greatly increase their efficiency, such as wind propulsion.

How does it Work?

Enterprises joining the NOx Fund pay a lower fee per kg NOx to the Fund instead of paying the NOx tax to the state. Importantly, the Fund must ensure sufficient NOx reduction measures

are implemented to meet the agreed reductions. If the reductions are not met, the tax is re-imposed.

The 2019 tax rate is NOK 22.27 (US \$2.60) per kg NOx. The [current payment rates to the Fund](#) are lower at NOK 14.5 (US \$1.69) per kg NOx for the offshore industry - emissions connected to oil and gas extraction - and NOK 8.5 (US \$1) for other sectors such as shipping, fishing, land-based industry, aviation and district heating. The differing amounts reflect the higher difficulty of reducing NOx from the offshore industry, so that the higher rate provides them with a greater incentive to introduce NOx reduction measures. For the years 2020-2025, payment rates are expected to be flat at NOK 16 (\$1.87) and NOK 11 (\$1.29) per kg NOx respectively. These amounts are decided by the Board of the Fund, which is drawn from its member businesses based on analysis done by the independent entity [DNV GL](#), illustrating how much money is required to achieve the reductions necessary to meet the target. In total, the NOx Fund creates a tax exemption of approximately NOK 2 billion (US \$234 million) annually.

How is Money Recycled in-Sector?

The Fund does not generate a profit and is managed in accordance with the full cost recovery principle, thus the Fund uses all payments received to reduce NOx emissions amongst its members in a cost-effective way with the exception of necessary administrative costs.

In order to join to the Fund, all businesses must develop a long-term plan for reducing their NOx emissions that identifies all possible

NOx reduction measures. This plan will first identify any cost-effective reduction measures the business can carry out without support of the Fund. Businesses are obligated to implement any cost-effective reductions before they can apply to the NOx Fund for support for the other measures that require that support in order to be commercially viable.

Businesses can submit requests for up to 80% of the investment cost of NOx reduction measures. However, the final support amount received is determined after the measure has been completed and the NOx reduction is verified by DNV GL which also provides recommendations regarding the prioritisation of measures to ensure the most cost-effective use of the Fund's finances.

How is it Enforced?

Fund members submit a NOx tax report to the Fund each quarter detailing all their NOx emissions. Various verification checks are carried out – for shipping, these include the use of AIS-data. Tracking the NOx emissions by quarter allows the Fund to be sure the NOx reductions are on track to meet the targets. In order to improve the documentation of NOx emissions, the NOx Fund also provides support for NOx measurement on ships and removable rigs.

The NOx Agreements, constituting the framework for the efforts of the Fund, are also an important part of the enforcement. The first NOx Agreement was for the period 2008-2010 and was subsequently followed by an agreement for the period 2011-2017. The most recent NOx Agreement, signed by 15 business organisations and the Ministry of the

Environment, covers the period 2018-2025. All businesses obligated to pay the NOx tax may join the NOx agreement.

The current NOx agreement involves some important changes from the Fund's previous agreements. Firstly, members of the Fund must now meet an emissions ceiling. The authorities can renegotiate and lower these emission ceilings so that the businesses would be required to ensure even further NOx emission reductions. Secondly, there are new criteria for calculating sanctions if the goals of the Fund are not met. For example, the authorities can now terminate the agreement if NOx emissions are exceeded by 5 percent of the emission ceiling. Also, if the emission ceiling is exceeded by more than 3 percent over a two-year period, all the Fund members will face a sanction, though the sanction cannot be more than the NOx tax imposed outside the Fund.

What has been achieved?

The Fund has been a great success. Between 2008 and 2010 the Fund led to a total reduction of 18,000 tonnes of NOx, whilst the 2011-2017 agreement has resulted in 16,000 tonnes of NOx reductions. Norway saw a [4.2 percent decline](#) in emissions of NOx in 2017 compared to the year before.¹ This can be largely attributed to the Fund's operation as most of the reductions came from businesses participating in the NOx Fund. The NOx Fund will have supported measures that will result in an expected 45,000 tonnes of NOx reduction over the course of its life by 2019. Of that amount, the shipping industry will have

contributed [25,000 tonnes](#) of emissions reductions by 2019.

The fee per kg of NOx has driven businesses to find cost effective ways to reduce their NOx emissions and the ability to request up to 80 percent of the investment costs for less cost-effective measures has spurred investments that would not otherwise have happened.

The NOx Fund has been of great importance for industries developing NOx reduction technologies. These include engine suppliers such as Rolls Royce and Wärtsilä, but also companies like Siemens with advanced battery technology. In the shipping industry, the Fund has supported new LNG vessels and NOx cleaning catalysts.

To date, the Fund has paid over NOK 4 billion (US \$468 million) for NOx reduction measures. And the NOx Fund has pledged a total of over NOK 5.5 billion (US \$644 million) if businesses do everything in their approved submissions to the Fund to reduce their NOx emissions.

In addition to the money directly spent through the Fund, since 2008 an additional NOK 14 billion (US \$1.64 billion) has been spent by Norwegian businesses on NOx reduction measures that have been identified through the NOx reduction plans all businesses were required to produce in order to join the Fund. The opportunity to join the Fund has been a good motivation for businesses to invest in these measures. This in turn has led to an increase in demand for NOx reduction technologies,

¹ Statistics Norway's data includes some NOx emissions not covered by the NOx Fund, such as energy supply and heating.

predominantly within the maritime sector, which has received the largest share of the Fund's income. This has allowed Norwegian industries to thrive in an international market.

Case Studies from the NOx Fund

MS Stavangerfjord: The World's First LNG Cruise Ship

Norwegian ferry operator Fjord Line's ship MS Stavangerfjord was launched in 2013. It operates the Hirtshals-Stavanger-Bergen and Hirtshals-Langesund routes as well as the domestic route between Bergen and Stavanger. It, and its sister ship MS Bergensfjord (also run by Fjord Line) are the [first cruise ships in the world that run entirely on liquid natural gas \(LNG\)](#). These ships are set to reduce 270 tonnes of NOx each year compared to the alternative of using heavy fuel oil.



MS Stavangerfjord, NOx Fund 2018

Libas: The world's first LNG fishing vessel with battery technology

Lie Gruppen, a family-run business, has announced the development of the Libas shipping boat. Libas will be built with a LNG tank along with a large battery pack. As a result, [it will become the world's first fishing boat driven with LNG and battery propulsion](#).

Once operational, Libas is set to produce 100 tonnes less of NOx each year compared to a standard fishing vessel.



Battery and LNG-fuelled fishing vessel Libas, NOx Fund 2018

Conclusion

The UK has recently launched the Clean Maritime Council in order to consider policies to make UK shipping sustainable. The UK should consider introducing concrete policies that will work to de-risk investment in shipping greenhouse gas emissions reduction technology, as the NOx Fund has done in Norway for NOx emissions. As detailed in this note, the NOx Fund has been highly successful in incentivising businesses to invest in NOx reduction technologies that otherwise would not have been invested in. Consequently, this has paved the way for environmental, technological and financial benefits: the Fund has invested over NOK 4 billion and has given support for over 1,000 NOx reduction measures, achieving a reduction of 44,000 tonnes of NOx.

The NOx Fund is an interesting model for the UK (and other countries) to consider as they look to reduce carbon emissions from shipping. It allows businesses to recycle money within their industry while also incentivising

emissions reductions beyond those driven simply by a flat tax on emissions, by creating an investment pot. This is also an interesting model for the International Maritime Organisation as it considers mid- and long-term measures to reduce shipping's climate impact. If a price is placed on carbon emissions from international shipping, the revenue generated can be recycled into investments into research, development and deployment of zero-carbon fuels and ships, in order to drive the quickest possible route to decarbonisation. The technologies exist to decarbonise the shipping industry. All that is needed is a sensible policy to enable the investments to happen. The NOx Fund provides a good working example of just such a policy.

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