The basic facts

How do the emissions of ships and cars really compare?

English summary and conclusions

CE Delft

Committed to the Environment

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Summary

As a stark illustration of the scale of maritime shipping emissions these are often compared with car emissions, with claims like the following being made:

- 'The sixteen largest ships emit the same amount of CO_2 as all the world's cars.'
- 'The world's seventeen largest ships emit more sulphur than the global car fleet.'
- 'A seagoing container vessel is just as polluting as up to 50 million cars.'

The aim of this concise study is to fact-check these kinds of claims. To this end estimates of the CO_2, SO_X and NO_x emissions of maritime vessels and cars were established and used to assess the veracity of these claims. The study shows that the majority of such claims are false.

CO_2

The CO_2 emissions of the global car fleet are two to four times higher than those of the maritime fleet and those of a relatively small number of the largest vessels (e.g. sixteen) thus at least an order of magnitude lower than the emissions of the car fleet.

NO_x

Per unit of fuel, ship's engines emit more NO_x than most car engines. The NO_x emissions of the maritime fleet are therefore probably higher than those of the global car fleet. It does hold, though, that the NO_x emissions of the *largest* seagoing vessels are several orders of magnitude lower than those of all cars combined.

SO_x

The statutory limits for sulphur in shipping fuel are higher than for road-vehicle fuels, in most countries at any rate. In Europe the limit for road-vehicle fuels is 0.001%, whereas the global limit for shipping is 3.5% (to be lowered to 0.5% in 2020). This means it is feasible that the sixteen largest maritime vessels emit just as much SO_X as 800 million cars. It then needs to be assumed, though, that the ships burn fuel with 3.5% sulphur, while the average sulphur content is a percentage point lower than this limit. This also makes it feasible that a single container vessel emits the same amount of SO_X as 50 million cars. It must then be assumed, though, that these cars use fuel with a very low sulphur content. The maritime fleet as a whole emits more SO_x than the global car fleet.

Conclusions

Despite the major uncertainties surrounding car emissions data, it proved feasible to assess the veracity of claims concerning the relative magnitude of the emissions of cars and large maritime shipping vessels.

There is such a big difference between the annual CO_2 emissions of a small number of large seagoing vessels and the annual CO_2 emissions of the global car fleet that the claims in question can be rejected: the annual CO_2 emissions of a small number of large seagoing vessels are indisputably lower.

With respect to NO_x emissions it can already be concluded on the basis of the emissions of half the car fleet that the annual NO_x emissions of a small number of large seagoing vessels are in a different ball-park from the annual NO_x emissions of the global car fleet. The annual NO_x emissions of a small number of large maritime vessels are indisputably lower.

While there is clearly less difference between the annual SO_X emissions of a small number of large seagoing vessels and those of the global car fleet, according to our calculations the SO_x emissions of the car fleet are still higher.

That there is far less difference between the annual SO_x emissions of a small number of large maritime vessels and those of the global car fleet than in the case of CO_2 and NO_x emissions can be explained by the fact that the sulphur limits for road-vehicle fuels are far more stringent in many countries than those in force for shipping fuels.

Some of the claims comparing the SO_x emissions of a small number of large seagoing vessels with a specific number of cars are therefore correct under certain assumptions regarding the sulphur content of petrol and diesel.

It is therefore likely that most claims are made with the aim of getting more stringent sulphur standards introduced for maritime shipping fuel.

The IMO has announced that the fuel standards in force for ships sailing outside Emission Control Areas are to be tightened as of 2020, with the maximum sulphur content then being lowered from 3.5% to 0.5%. Even then, though, this limit will be higher than that in force for road-vehicle fuels in many parts of the world, including the EU.

Ultimately it is to be queried whether a comparison of the emissions of cars and ships is a useful exercise. In our opinion it is far more relevant to compare shipping emissions with the emissions of other modes of cargo transport. In the literature there are various comparisons of the emissions of transport modes per ton-kilometre (examples are provided in Appendix D of the main report). These comparisons can give an indication of the relative magnitude of the footprint of the various modes. This said, though, the only truly robust comparison is for a specific case involving a specific load and allowing for the upstream and downstream transport required to get that load from A to B.