

## Environmental Considerations of International Shipping: Sea and Road vs. Air Freight

Report by Danny Chivers with GCC, April 2022

### Introduction

Sea freight and road freight both have a much smaller climate impact (per tonne-km transported) than air freight. **For every tonne of artwork, air freight produces around 10 times more CO<sub>2</sub>e than freighting the same distance by road, and around 60 times more CO<sub>2</sub>e than the same distance by sea.**

As such, sea and road freight represent our best options for cutting emissions from art transport in the short to medium term. However, while these options – particularly sea freight – are much lower carbon (and potentially cheaper\*) than air freight, they still have their own environmental impacts. If the art world is successful in shifting the bulk of art transport from air to ocean and land freight, then the environmental impacts of these latter methods will become ever more significant. It's therefore important that we minimise and reduce these impacts wherever we can, and support initiatives to clean up ocean and land transport as part of our low-carbon transition.

---

\*GCC acknowledges that, due to the disruptions caused by Brexit, the Covid-19 pandemic, the Suez Canal blockage and conflict in Eastern Europe there are currently major disruptions to global freight services resulting in delays and additional costs. These are (hopefully) temporary complications, which will be resolved in time allowing a return to the cost saving advantages of non-air freight methods.

## Environmental issues with sea freight

- The climate impact of transporting an artwork by sea is relatively small compared to flying the same artwork the same distance. This is partly because air freight is so high-carbon, and partly because of the sheer scale of the huge container ships that are used to ship goods across oceans. Each tonne of cargo is responsible for just a tiny fraction of the fuel use of the ship. However, this does not mean that the fuel used by the ship is particularly clean – in fact, international shipping uses some of the dirtiest, low-grade diesel fuels available. In addition to climate-warming carbon emissions, this means these ships also produce high levels of air pollution, creating serious health risks in busy ports.
- Ships can take on ballast water in one part of the world, and then release that water back into the sea in another part of the world, potentially introducing new invasive marine species which can damage the natural ecosystem.
- A recent investigation found that many ships are illegally dumping polluted bilge water – containing oil and toxic chemicals – straight into the sea.
- Anti-fouling coatings (biocides) are applied to the hulls of ships to prevent the growth of mould and algae and maintain speed efficiency. When the hull is cleaned these chemicals are transferred to the ocean and are toxic to marine life.
- Sewage and garbage from humans on ships often gets transferred to the ocean rather than being properly disposed of, which is damaging to marine life and ecosystems.
- Dredging in shipping lanes can cause damage to natural environments and their biodiversity.
- Maritime shipping constitutes a major source of low-frequency noise in the ocean. Underwater ship noise is an incidental by-product from standard ship operations, mainly from the rotation of propellers and concerns have been raised over the effects of these increased noise levels on marine life.

## Solutions

- Growing numbers of voices are calling for a rapid transition to zero-carbon shipping. This would probably involve a mixture of electric motors and sails

for smaller craft, and renewably-generated hydrogen for larger vessels. While most such ships are still in the experimental stages, some significant players have made some moves to cut emissions from their existing ships. For example, shipping giant Maersk is installing electric charging at key ports so its ships don't need to run their diesel engines to provide onboard power while docked. Other companies are also working on more efficient ship designs.

- However, at the moment progress in this area seems slow, with the International Maritime Organisation (IMO) under pressure to set tougher emissions reductions targets for the industry more in line with climate science. There's a risk that the next generation of ships might still be powered by fossil fuels, which – even if they're slightly cleaner than existing diesel ships – would “lock in” unacceptable levels of carbon pollution for decades.
- By working with shippers to push for zero-carbon ocean transport – and supporting experiments and initiatives in cleaner shipping as they arise – the arts sector can play a crucial role in accelerating this change. While art shipping may only make up a small fraction of global transportation, the arts sector has the potential to have a disproportionate positive impact, by using its public platform – and creativity – to share stories and promote this transition.
- Beyond the fossil fuels used in shipping, its other impacts also need to be tackled. Ballast water can be treated to prevent the spread of invasive species; less toxic hull treatments, stricter rules on ocean dumping and better technology to prevent bilge dumping could be developed with enough demand. Again, arts organisations could add their voices to wider global campaigns on these issues as ocean transport becomes a more significant part of our business models.
- Progress on many of these issues has stalled during the pandemic, which has created major disruption in global shipping and also led to price increases for sea freight. As we move beyond the worst of COVID-19, we can expect these problems to ease and costs to fall again, meaning there should be cost savings compared to air freight.

## Environmental issues with road freight

Fossil-fuelled road transport is, of course, responsible for significant amounts of carbon emissions. However, transporting one tonne of artwork by road produces one-tenth of the climate impact of transporting it the same distance by air.

This means that, in the short term, a shift from air to road freight for cross-continental art shipments will help to reduce emissions. And in the medium term – unlike air freight – there are ways in which road freight could become much lower carbon by 2030.

Arts organisations can help to make this happen by working with shippers to support and encourage the development of low-carbon road freight. Some of the key issues that need to be tackled include:

- Air pollution from fossil-fuelled vans and trucks has a significant impact on not just the climate but also people's health.
- Heavy goods vehicles (HGVs – lorries, trucks etc) are responsible for almost a quarter of carbon emissions from road transport in the EU. This figure is increasing, not decreasing as the need to transport goods goes up.
- Heavy duty vehicles comprise only about 5% of all vehicles on the road but generate more than 25% of global warming emissions across the globe.

## Solutions

- Trucks drive billions of miles each year empty or only partially full. Researchers have found 20-50% of truck journeys carrying empty loads in many countries. There is huge potential for using new technology and smart logistics to capture this wasted capacity and make large carbon savings in existing road freight.
- Several major vehicle manufacturers are developing or have already released electric HGVs to market. Whilst they are currently more expensive than their fossil fuel equivalents, the cost savings on diesel should make them more economic in the long run. Major companies (such as John Lewis and Tesco in the UK, and FedEx, DHL and others in the US) have already

started to electrify their delivery fleets, which will help stimulate the wider market and bring the costs of these vehicles down. If national electricity grids continue to shut down more polluting power sources and replace them with renewable energy, road freight by electric HGV will become an increasingly low-carbon option.

- While electric vehicles do require more energy to manufacture than fossil-fuelled vehicles, they have a much lower environmental footprint across their full lifespan. Mining the rare metals needed for battery production in electric cars also has a particular environmental impact that needs to be minimised as much as possible; however, this must be compared with the impacts of extracting enough oil to fuel a diesel truck across its entire lifespan. We need to make sure that the production of electric vehicles – and other low-carbon technology – is carried out in as responsible a way as possible, but in the long term their impact should be far smaller than the fossil fuels they are replacing.
- 

## Conclusion

Despite the negative impacts outlined here, both sea and road freight are still less impactful than sending the same object the same distance by aeroplane. Crucially, they allow the art world to significantly decarbonise in the time-frame we need (by 2030), unlike aviation. Most serious assessments agree that low-carbon flights (powered by electricity or other alternative fuels) are unlikely to be feasible on a meaningful scale until after 2030 – meaning that in order to halve our emissions in the timeframe demanded by climate science, we need to urgently reduce our reliance on aviation over the next few years.

When switching from air to ocean or road freight, it's important to acknowledge that these alternatives do have negative impacts, albeit much smaller ones than aviation. Alongside this shift, we need to reduce the volume of shipments as much as possible, and to lobby shippers, hauliers, freightliner companies and industry bodies to innovate and accelerate the transition to lower impact ships and vehicles. We should also look out for positive alternatives to support and showcase where we can. As a public-facing sector with a wide reach, this is one way we can punch above our weight in helping to speed up the transformation of transport.