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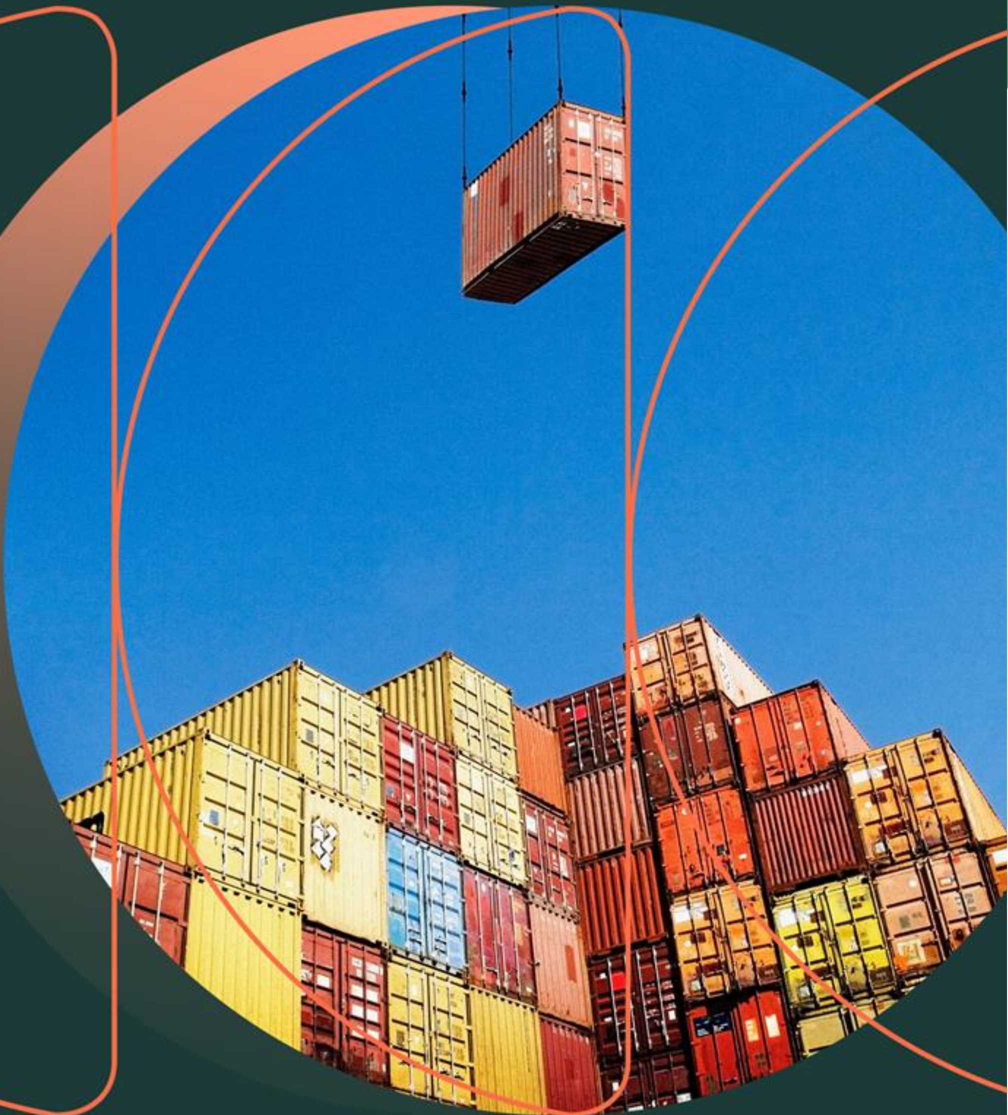


Reducing shipping emissions by reducing demand for goods

Policy brief | July 2025

Addressing shipping demand has significant GHG potential

Measures to reduce global shipping emissions have traditionally focused on changing the operations of the ships themselves, from switching fuels and propulsion technologies, to adjustments of routes and mooring times. This focus on the *supply* of shipping services, and its output of greenhouse gas (GHG) emissions, has meant excluding the possibilities of shifts in *demand* for those same services. Emissions from a ship are a product not only of the engine and fuel being used, but how hard and for how long that engine has to work. Shorter, fewer journeys and lower total weights transported will also reduce fuel consumption and therefore emissions. Technology is hard to change quickly, but journey length, frequency and cargo weight can all be rapidly altered.

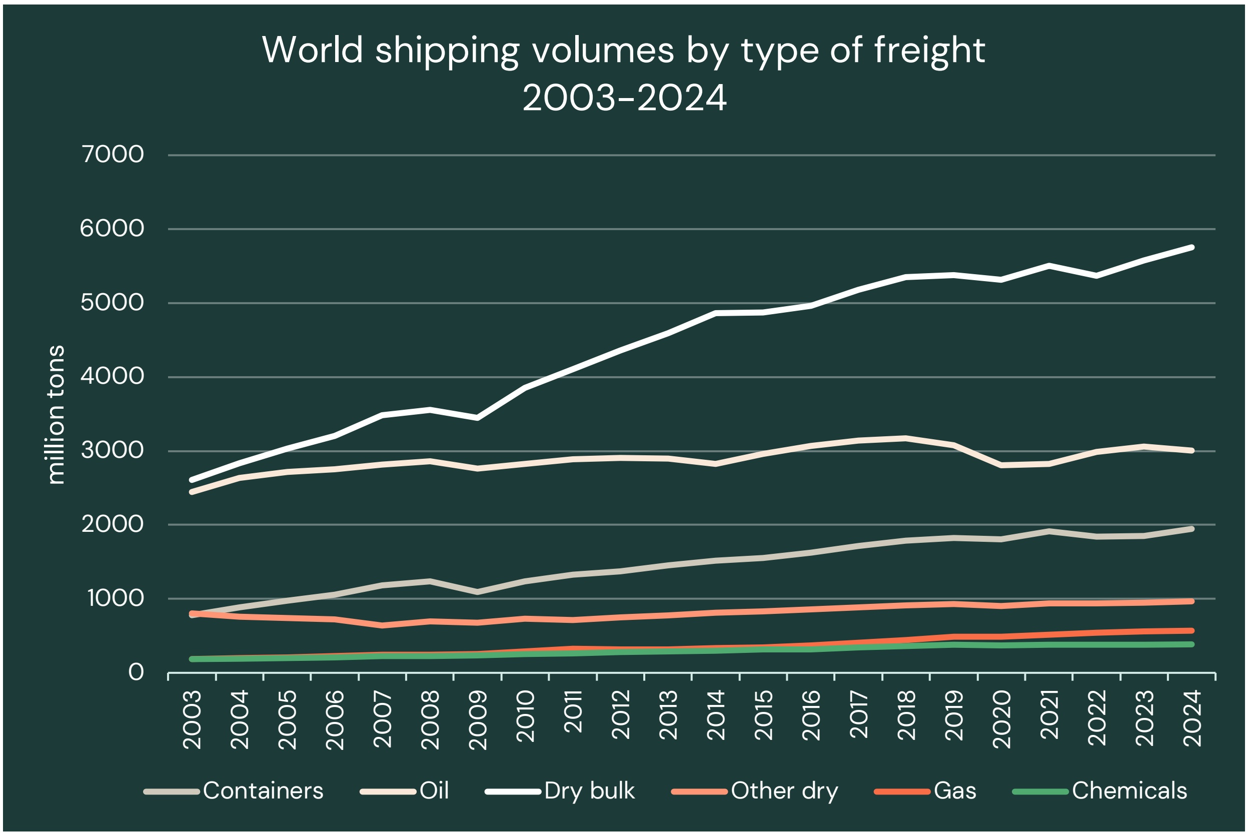
Our new estimates, shown here for the first time, suggest that potential savings on the long-distance, seaborne transport of produced goods are a significant proportion of savings from flying reduction: emissions from the transport of electrical machinery globally, for example, in a single year matches two years' worth of New York-London flights. In principle, there is therefore a case for altering the demand for shipping as a route to reducing GHG emissions.

This paper lays out the plausible scope of the potential demand reductions available by reducing demand for containerised trade using circular economy methods in destination economies. These methods include recycling, reusing, repairing and reprogramming, rather than demanding new shipments of manufactured goods over substantial distances. At a time where the reshoring of production is assuming a central place in economic policymaking, and when increasingly active use is being made of tariff and non-tariff measures to shape global trade, a substantial policy space has opened up for such measures, potentially made in close alignment with other economic and security policy goals.

Because the volume of world trade is now so vast, coming to 12,292m tonnes of goods and materials transported by ship in 2024, even small modifications to that trade can produce substantial GHG reductions. Action taken by the major destination markets in the goods trade, meaning here the US, EU, UK and other developed countries, can start to impact on that volume of emissions. Crucially, policy here can start to develop win-wins: first, in reducing the potential cost to consumers of products that require regular replacement; and second, in encouraging the growth of domestic repair and related industries.

Freight shipping today

Shipping accounts for 80% of world trade, and volumes have grown exponentially in the last 40 years, with global shipping acting as the foundation of the modern, globalised economy. Technological advances, particularly including the containerisation of goods transport, enabled reductions in the cost of long-distance transport coupled to huge growth in capacity. The graph below shows the last 20 years of ocean-bound freight volumes, divided by product category.



Source: UNCTAD Review of Maritime Transport, based on data from Clarksons Research Services, Shipping Intelligence Network, April 2025.

The continuing, rapid growth of containerised transport is visible, with volumes more than doubling in 20 years. So, also, is the doubling of dry bulk freight that makes up 45% of all ocean freight by volume. This preponderance in the total weight reflects the physical nature of dry bulk freight: iron ore, coal, steel, grains and various other standard commodities are all heavy, and typically traded in bulk. Inevitably, these bulky commodities will be heavier, for every dollar's worth transported, than the lighter, typically consumer-focused freight of the container trade.

But it is important to note that a very substantial part of this surge in demand for dry bulk cargoes is itself dependent on the surge in demand for containerised transport and other transport. To make a car requires steel, which in turn requires iron ore and (with older furnaces) coal for coking, for example. The bigger the pull from consumer demand for final products, whether cars, televisions, or furniture, the greater will be the pull on the raw materials needed to produce them. China's status as the workshop of the world can be seen not only in its extraordinary export of finished consumer products, but the even more dramatic pull it has on dry bulk cargoes. Two-fifths of the world's entire dry bulk trade ends up in China;[1] two-thirds of all iron ore transported by sea is imported by China.[2]

Understanding this relationship gives us an insight into the spaces for possible policy intervention. Changing the demand for transported final consumer products, of the kind typically carried in containers, will in turn change the demand for the raw materials transported by bulk. If we were to reduce the demand for final outputs, or at least shift that demand away from seaborne transport, we would generate substantial impacts further up the supply chain. The important point, however, is to grasp the critical link in that supply chain – which is the final output for consumer products, where policy interventions in importing countries are the easiest to implement and can be leveraged for greatest impact.

The "Trump shock": a natural experiment for emissions reductions

The announcement by US President Donald Trump of 10% minimum tariffs, across the world, on 2 April, was the policy equivalent of a bomb exploding under the world's trade regime. With the 10% minimum charge already many times higher than US tariffs had been since the early 1980s, a significant number of countries faced exceptionally high new costs for selling imports to the US, apparently based on the size of their export surplus into the United States. International outcry, including notable turmoil in key financial markets like that for US government debt, appear to have motivated Trump to "pause" the new tariff schedule, imposing instead 145%[3] tariff on the US' biggest goods trading partner, China. Reciprocal measures, both tariff and non-tariff, followed from a number of countries, including China; others, like the UK, rushed to sign whatever deal they could make.

Even with (at the time of writing) an easing of international tensions and a ceasefire in the US-China trade dispute, following talks between the two countries in May, the world trading system is unlikely to return to its old shape. Suppliers have rerouted their supply chains across the globe, seeking both to avoid tariffs themselves, and to avoid even the risk that they might be reimposed in some form by a mercurial Washington administration. Trump's stated aim was to provoke a return of manufacturing to the US; others in the administration,

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[1] Liv Almer, "Record dry cargo stocks leave China with two crucial choices impacting bulkers", *Shippingwatch*, 3 October 2024.

[2] Amy Lv, Lewis Jackson, "China's 2025 iron ore imports set to hit new high even as steel demand dwindles", *Reuters,* 2 January 2025.

[3] Polos Zsofia, "Hapag-Lloyd reports 30% drop in China–US shipments", Trans.Info, 24 April 2025. [Hapag-Lloyd: shipments drop 30% on China–US route | trans.info]

notably Treasury Secretary Scott Bessent, take a broader view of the "reordering" of the global trade system they wish to achieve.

But crucially, amongst the uncertainty, trade has been directly impacted. Scheduled container capacity on the main Asia-North America routes dropped 12% over the four weeks from mid-April to mid-May.[4] Major container shipping line Hapag-Lloyd reported a 30% drop in bookings on China-US sailings by the end of April.[5] These cancellations in turn led to a surge in "blank" sailings, where a container line cancels a scheduled stop or stops. However, because ships were no longer sailing, emissions from shipping fell. Because the original tariff schedule was rapidly paused, the full impact is hard to estimate, since the full set of tariffs was not introduced and remains suspended until (potentially) early July. Nonetheless, one forecast suggests that a 1% decline in GHG emissions would result from the "Liberation Day" tariffs[6] – a small number but, in the context of increasingly tight carbon budgets, one that cannot be dismissed.

This inadvertently demonstrates the possibility here: with a more targeted intervention on shipping distances and weights, a significant reduction in GHG emissions could be achieved – rather than appearing as the unintended by-product of a different policy intervention. If governments around the world are more prepared to change the conditions under which trade is conducted, and intervene more directly to support manufacturing, then one possibility open to governments is actively reducing the demand for shipping transport, and so shipping emissions, by reducing the amount that is needed to be shipped.

In the section below, we provide some initial estimates for the most recent revisions to the US tariff schedule, announced on 12 June 2025 and covering consumer "steel derivatives" products like washing machines and tumble driers.

The scope for intervention

Since the volume of emissions produced by a ship, given its engine technology, is a product of the weight of its cargo and the distance it travels, we can quickly demonstrate the scope of potential savings to be made from adjusting weights and/or distances transported.

Separate but compatible estimates are available for the total volume of goods transported by different shipping sub-sectors, and for the number of ships, the

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[4] Sea Intelligence, "Substantial blank sailings on the Transpacific", press release, 16 April 2025. Sea-Intelligence - Substantial blank sailings on Transpacific

[5] Polos Zsofia, "Hapag-Lloyd reports 30% drop in China–US shipments", Trans.Info, 24 April 2025. Hapag-Lloyd: shipments drop 30% on China–US route | trans.info

[6] Jennifer McDermott, "Could Trump's tariffs slow emissions? Sure, experts say, but at great cost overall", *Independent*, 11 April 2025. Could Trump's tariffs slow emissions? Sure, experts say, but at great cost overall | The Independent

average distance each ship travels in a year, and the total GHG emissions of the same sub-sectors. Using this information, we can produce a preliminary demonstration of the potential savings to be made from demand reduction, and highlight where policy interventions would be most effective.

The table on the following page shows the total cargo weights, average journey lengths, and total emissions for the major shipping subsectors in 2023.

Weights, journey lengths and emissions of cargo shipped by type, 2023

Cargo type	Total cargo weight (m tones)	*Share of total*	No. ships	Distance per ship (nautical miles)	Emissions (CO_2e m tones)	*Share of total CO_2e*
Containers	1,848	14.9%	5,836	69,195	184.408	26.0%
Dry bulk	5,580	45.1%	12,816	46,739	142.821	20.2%
Oil	3,057	24.7%	8,188	29,984	131.728	18.6%
Other dry cargo	952	7.7%	19,304	27,603	110.996	15.7%
Chemicals	382	3.1%	6,491	36,188	68.647	9.7%
Gas	558	4.5%	2,321	59,180	69.380	9.8%
Total	**12,377**	**100.0%**	**54,956**	**45,506**	**707.982**	**100.0%**

Source: transported cargo weights from UNCTAD; GHG estimates, ship numbers and average distances travelled in a year from ICCT 2025.

Dry bulk shipping, made up of the transport of heavy primary commodities (principally iron ore, grain and coal) carried the largest total volume of goods in 2022, as in previous years. Next was oil, making up over a quarter of the total weight of goods transported by sea that year. But in both cases the relatively short average journeys meant they contributed proportionally less to the sectors' overall emissions, as indicated in the final column above.

Container shipping transported more than 1,800m tonnes of cargo in 2022, or 15% of the world's total seaborne freight by weight. But its contribution to emissions is significantly larger, at well over a quarter of all shipping's GHGs. Importantly, the distance typically travelled by a container vessel is somewhat further than average for the global shipping sector, since the busiest regular routes are Asia-North America and Asia-Europe, significantly greater distances than the shorter routes more common for dry bulk and other cargo shipping. This gives container shipping a disproportionate share of GHG emissions, as indicated in the emissions column. As a result, relatively smaller weight reductions for containerised goods will typically produce relatively larger gains in GHG emissions.

Relatedly, whilst container ships only transport 15% of the world's seaborne freight by weight, the value of what is transported far exceeds that. Around 60% of the world's freight *by value* is transported by container ships,[7] a result of the concentration of relatively-higher value manufactured goods like consumer electronics in the container trade. This creates greater scope for intervention, since even policies that introduce some additional cost will not completely overwhelm a particular goods market, as a rule (adding £1 onto something that usually costs £1 is doubling its price; adding £1 onto something that costs £100 is only a 1% increase). Putting both the disproportionate GHG emissions alongside the disproportionate value of the container trade, and it is clear that the policy leverage for demand reduction measures here is greatest.

The structure of global container trade

As noted above, containerised shipping carries over 60% of the world's trade by value. This trade is not evenly spread across the globe, but reflects the distribution of main production sites, typically now in East Asia, and main sites for consumption, typically now in Europe and North America. The table below shows the distribution of container transported goods by volume in 2022.

	Share of global container transport
Main East-West	37.5%
Intraregional	27.6%
Non-mainlane East-West	13.2%
South-South	12.5%
North-South	9.1%

Source: UNCTAD 2023, Table 1.3. Non-mainline East-West: Trade involving Western Asia and the Indian Sub-continent, Europe, North America, and East Asia. North-South: Trade involving Oceania, Sub-Saharan Africa, Latin America, Europe, and North America. South-South: Trade involving Oceania, Western Asia, East Asia, Sub-Saharan Africa, and Latin America.

In recent years, trade outside what had become the dominant East-West routes has been growing, with South-South trade (e.g. Latin America to Africa) and intraregional trade (reflecting supply chain growth inside East Asia, in particular) both taking a larger share. China-US container trade had been falling even ahead

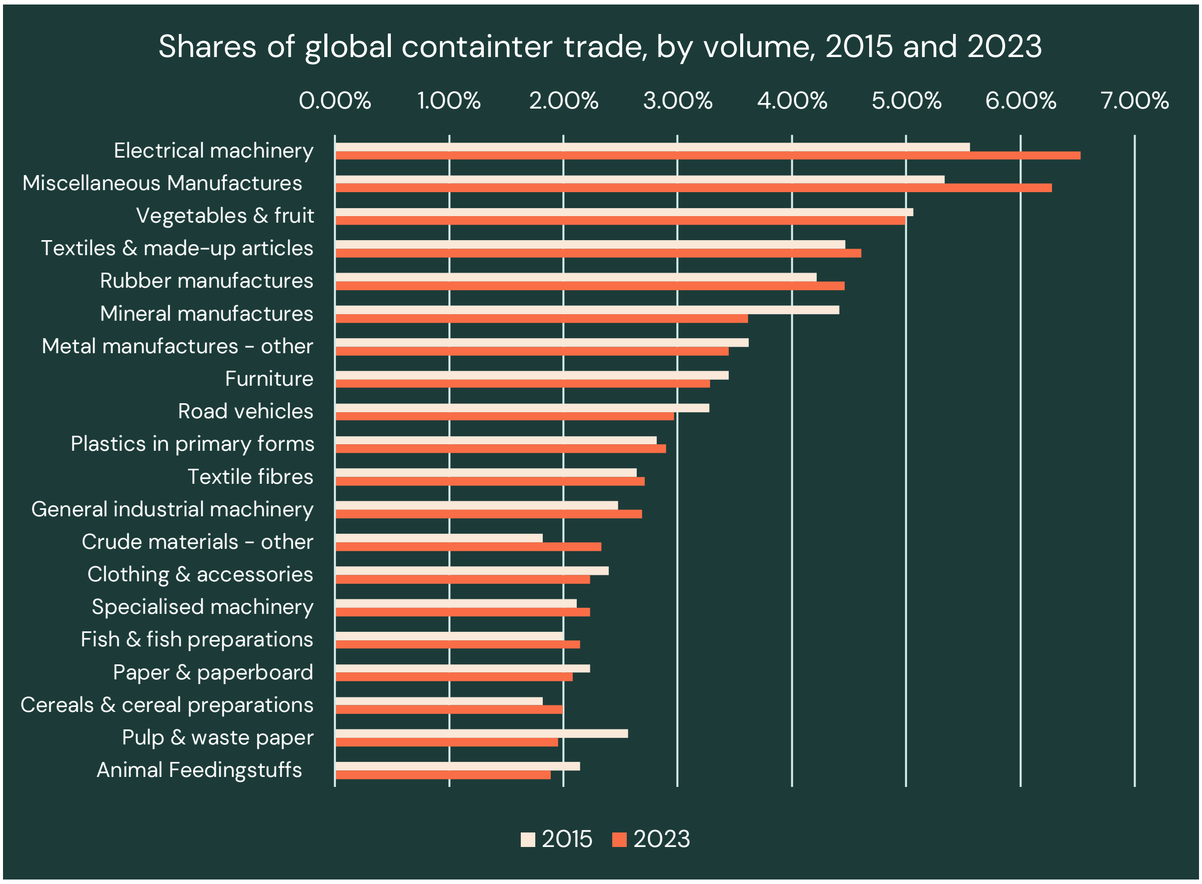
[7] World Shipping Council figure: World Shipping Council

of the recent tariff shock, and is now likely to decline further, whilst the typically shorter distances of the rest of the world trades will assume more prominence.

Inside the containers

The principle of container shipping is the simple idea that by standardising goods transport, very substantial cost savings can be made and efficiencies of scale generated. Each container is based on the same sized "Twenty Foot Equivalent Unit" (TEU), which allows port equipment to be standardised and substantially automated, as well as maximising the use of space on the ship. But each container can then hold an exceptional variety of goods, and it is the goods the standard box contains that determine the weight of the total transport. By reducing the weight of goods in these boxes, and reducing the distance each box travels from port to port, reductions in GHG emissions can be found.

Reducing demand for the content of the containers means finding substitutions: for example, producing or, more likely, repairing manufactured products in an export-destination country, rather than importing from a distant producer via shipping. To understand the scope that might be available here, we need to look inside the containers and find out what is being transported, and then from where to where. The graph below shows the shares of different kinds of commodities in overall container trade volumes in 2015, and 2023, the most recent year for which we have shipping emissions data.



Source: MDS Transport.

These different goods are shown grouped into Standard International Trade Classifications (SITC) categories. SITC is the UN-agreed standard means to classify traded goods, at different levels of granularity, allowing for international comparisons to be made. The SITC categories are arranged in a hierarchy, from the broadest groups to the most granular, with more digits being added to the code at higher levels of granularity. For example, SITC 1 is "Beverages and Tobacco"; SITC 11 is "Beverages"; SITC 112 is "Alcoholic Beverages"; SITC 1121 is "Wine". The graph above shows two-digit classifications; it is possible, using international trade figures, to move beyond this to break open big, non-descript groups like "miscellaneous manufactures" to understand better what is inside.

Nonetheless, we can already draw some conclusions. The first is the sheer breadth of what is transported, from car parts to fruit and nuts. The second is that whilst no category of goods dominates, we can still see where the biggest wins are likely to be. Notably, both "electrical machinery" and "miscellaneous manufactures" have substantially increased their (already comparatively large) share of rising total volumes of trade.

We can already give an approximation for the GHG emissions associated with this specific trade. In 2015, the transport of electrical machinery accounted for 5.6% of total container volumes transported. As a share of total container shipping emissions, this is 10.25m tonnes of CO_2e. By 2023, electrical machinery accounted for 6.5% of total volumes transported. This implied substantially higher associated emissions, of 12.03m tonnes of CO_2e,[8] a GHG equivalent to twice the annual number of flights from London to New York. The increase in emissions from growing volumes of seaborne electrical machinery transport alone is enough to wipe out the entire saving on CO_2 equivalent emissions from agriculture in England over the same period, 2015 to 2023.

Another significant area for intervention is likely to include furniture, where a relatively small number of bulky but relatively high-value goods are transported. Furniture is typically easier to repair and reuse than other items, and more open to local production than specialist electronic equipment. On the same basis as electrical machinery furniture would be responsible for would be responsible for 6.05m tonnes of CO_2e from its transport alone.

Obviously, we will not be able to simply cancel these trades. But such is the volume of world trade, and its associated emissions, that relative minor reductions in the weight of transport start to cumulate into significant reductions overall. Moreover, to the extent that policy to reduce the weight of trade – for

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[8] This has to be viewed as a preliminary estimate, since in reality the relationship between emissions per ship and weight of cargo will not be simply linear, as implied here: ships will rearrange their cargos and travelling, and then there are emissions associated with the operation of loading and unloading of freight in ports. We have not considered here the on-shipment, overland, transport phases, but this also acts as a contributor to total transport GHG emissions per weight of goods transported.

instance, in reshoring production and increasing repairs – also has positive economic benefits, we can create win-wins. And with the renewed interest in the content of trade deals and their supply chain impacts, this proposal is of growing relevance: it adds a potentially important, low-cost climate dimension to a fast-growing area of global economic policy.

Further inside the box: specific product categories

The SITC classifications allow us to look further inside the containers. The categories at the next SITC level remain broad, but are of sufficient detail to allow us to see where supply chain interventions might be made.

The two tables on the following page show the breakdown for global shipping trades inside the "Electrical machinery" and "Miscellaneous manufacturers" higher-level SITC category. Each sub-group is paired with an estimate for its specific contribution to GHG emissions.

Electrical machinery		
	Share of trade	**CO_2e (tonnes)**
Electric power machinery	5.30%	637,674
Electrical apparatus for making connections to or in electrical circuits (e.g., switches, relays, fuses, lightning arresters, voltage limiters, surge suppressors, plugs and sockets, lamp-holders)	6.33%	761,500
Miscellaneous electrical machinery and apparatus	38.54%	4,637,545
Electrodiagnostic apparatus for medical, surgical, dental or veterinary purposes, and radiological apparatus	1.12%	135,211
Equipment for distributing electricity	11.11%	1,336,720
Household-type electrical and non-electrical equipment	28.34%	3,410,211
Thermionic, cold cathode or photo-cathode valves and tubes diodes, transistors and similar semiconductor devices.	9.26%	1,114,028
Total for category	100.00%	12,032,888

Miscellaneous manufactures		
	Share of trade	**CO_2e (tonnes)**
Arms and ammunition	2.04%	245,569
Plastic manufactured	54.56%	6,565,190
Baby carriages, toys, games and sporting goods	19.46%	2,341,621
Jewellery, goldsmiths' and silversmiths' wares, and other articles of precious or semiprecious materials	0.38%	46,126
Miscellaneous manufactured articles	11.02%	1,326,102
Musical instruments and parts and accessories thereof; records, tapes and other sound or similar recordings	4.25%	511,856
Office and stationery supplies	2.61%	313,825
Printed matter	5.49%	660,079
Works of art, collectors' pieces and antiques	0.19%	22,521
Total for category	100.00%	12,032,888

Although the biggest single categories remain the more generic sub-groups, already we can see some interesting points for intervention. Toys, games and sporting goods occupy a substantial part of emissions, as do household electrical appliances. In both cases, the products being transported are for household consumption, and are finished products – suggesting that reductions in supply chain lengths, for instance in the promotion of manufacture closer to points of final consumption of washing machines or refrigerators, would help reduce total emissions associated with their consumption. We have here some firmer figures on what sort of savings are available.

As an example, we can provide some initial, detailed estimates for the likely scope of the Trump tariff shock. On 12 June 2025, the Department of Commerce announced an extension of US steel tariffs to consumer “steel derivative” products including washing machines, dishwashers, fridge-freezers and cookers – in short, common electrical products found in the average household kitchen, now to be hit by a universal tariff for all importers of 50%. Using UN/World Bank data on volumes of imports for detailed product groups, we can show that in 2023, the greenhouse gases associated with these imports to the US alone came to 247 tonnes of CO_2e, or equivalent to two weeks’ worth of New York-London return flights – and this from kitchen appliance imports alone. In a world of tight carbon budgets, these marginal improvements matter; a targeted and more comprehensive approach could make serious and significant savings on GHG emissions.

Sources and destinations of goods, with their associated emissions

The trade data also allows us to see the sources and destinations for different categories of freight, and so estimate their associated shipping transport emissions. This is helpful, since it allows us to see both where legislative and regulatory changes might be needed on the destination side, and what sort of reach back to production countries is required.

Using broad, global regions, the table below shows the distribution of "miscellaneous manufactures" from the Far East (covering China, Japan, South Korea, and so on) to the rest of the world, and inside the Far East grouping. As expected, the richer, more developed markets of North America and Europe dominate the total trade, accounting together for more than half of the total volume of the goods shipped inside this category.

Miscellaneous manufactured exports from the Far East

	Share of sector trade	CO_2e (tonnes)
Australasia & Oceania	4.30%	394,874
Europe & Med	22.07%	2,025,728
Far East	21.85%	2,005,455
Gulf & ISC	7.31%	670,864
Latin America	5.60%	514,036
North America	35.45%	3,254,467
Sub Saharan Africa	3.43%	314,819
Total exported	100.00%	9,180,244

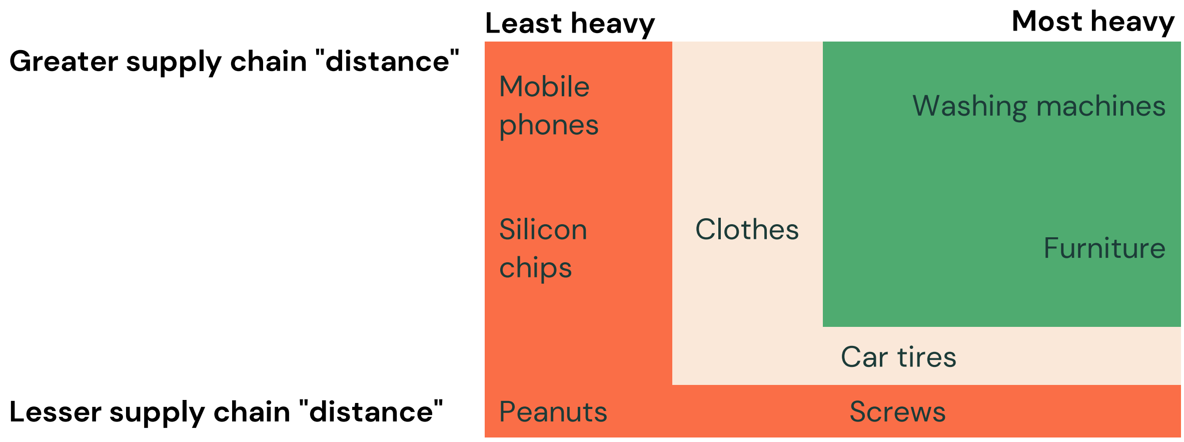
Supply chain length and possibilities for substitution

With a sufficiently high level of granularity in classification, it is also possible to understand how substitutable the elements of different products' supply lines actually are. In other words, how open each one is to either reshoring production (transferring operations that were moved overseas back to its original country); or significant recycling, repairing, and reprogramming; or significant end-of-life recycling domestically.

The analogue here is the work of the Oxford Martin School and others in developing estimates for the susceptibility of different kinds of work to automation: by understanding the tasks that make up different jobs at a sufficiently high level of granularity, it is possible to estimate how open each one is likely to be to automation, since we can know how easily each task can be automated inside the whole collection of tasks we call a "job".[9] The equivalent here is to understand the extent to which the supply chains currently involved in the production of a particular traded good could be domesticated in some form, usingthe circular economy methods we have highlighted.

In the first instance, this is a question of knowing the production-line "distance" from raw material input to finished product: products where manufacturing is a complex task (mobile phone manufacture, for example) are more "distant" in this sense from the raw material input than those for which manufacture is less complex: injection-moulded plastic toys, for instance.[10] This supply-chain distance matters, since the more steps involved in a process, the more opportunities there are for substitution and repair of parts, whereas something with a short supply-chain distance has relatively fewer points of intervention: in the simplest possible case, raw material-to-finished product, it can only be switched whole.

Using these generic accounts of supply chain distance for different categories of products gives us a ranking of potential substitutability along the supply chain and therefore (we argue) its openness to recycling, reusing, reprogramming and so on. For example, a mobile phone is highly complex, consisting of many parts. Each element in it is therefore open to substitution. Putting this ranking together with the weights forms a matrix – substitutability on one side, transported weights on the other – which will allow us to identify the top product lines to intervene in. A rough example of a finished distance-weight matrix is included below, with some sample products included. The most open to substitution are those goods and commodities that lie along the diagonal heading north and east from the origin of the graph.



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[9] Carl Benedikt Frey, Michael Osborne, "The future of employment", working paper, Oxford Martin School, 17 September 2013.

[10] Sejik Kim, Kiho Park, "Measuring the length of supply-chains", working paper, 21 November 2024. https://ssrn.com/abstract=5028966

Tariffs and non-tariff barriers: opportunities for intervention

After many years in which it was broadly assumed that tariff barriers globally were eroding, sustained institutionally by the World Trade Organisation, the last decade has seen a notable reverse in the direction of trade policy. Typically, some countries had maintained tariff and non-tariff barriers to trade, for reasons like protecting "infant industries" or attempting to maintain non-price standards in food. But the expected outcome of trade negotiations, and the functioning of institutions like Investor-State Dispute Settlement (ISDS) mechanisms, would lean towards the steady erosion of trade barriers, with major developed economies like the US leading the charge for free trade.

But since January 2018, when US President Donald Trump first introduced steep new tariffs on imports of solar panels and washing machines, followed later by steel and aluminium, that has no longer applied. Reciprocal tariffs by China, followed by the 2020 "Phase One" trade agreement and then the extension of the tariff regime (backed up by export controls) under Joe Biden locked the changes in place. By the time of the second, dramatic round of tariff increases early in Trump's second Presidency, the older, "globalised" free trade regime was already seriously weakened. It is now likely to have expired; at the very least, the policy space for tariff and non-tariff interventions in international markets by governments has been widened very substantially – which does, itself, create further uncertainty.

The changes are already causing redirections of trade and re-routings of supply chains. It is not possible to say with much certainty what the pattern of trade will look like over the next few years, given that so much is now subject to negotiations between countries that have barely even begun in most cases. But two general conclusions seem plausible: first, that suppliers will be less willing to use extended supply chains across multiple countries, with even uncertainty over future tariffs motivating changes to production, before any tariffs have changed; second, if goods everywhere cost somewhat more than previously, additional changes to prices introduced by policy represent a smaller percentage increase in the price of the commodity than previously, so may be more acceptable to the consumer. If a tariff regime has already increased domestic prices for a particular import by (say) 10%, that creates additional space for other policies, since the tariff-imposing government has the option to cut existing tariffs, or make other changes to the schedule to absorb or redistribute costs, if they wish.

This being the case, if absolute cost considerations no longer dominate and the "race to the bottom" no longer applies, a unique opportunity has been opened up to reshape global supply chains in the direction of sustainability and justice. An important part of that reshaping can include a consideration of the GHG emissions involved in creating and running very extended supply chains for very significant volumes of traded products. Calls for the "reshoring" and "friendshoring" (prioritising countries regarded as allies) of production can align well with efforts to reduce the volume of new products shipped significant distances. We can go further than this: another potential benefit from discouraging heavy volumes of trade over longer distances is precisely to encourage the shorter trade routes, notably in the Global South. These are already growing as a share of world trade, and doing so will help support a broader base for economic development outside of the richer world.

Circular economy policy options

The above represents preliminary work, identifying the scope of the issue of emissions, and some initial points for policy intervention. More research is needed to fill in the details, but the guide above at least suggests that some significant climate (and broader economic) wins can be generated from this approach to international trade.

The next stage is to identify appropriate policy measures. There are a growing number of initiatives across the world that attempt to address the problem of excessive waste from production and consumption. Assessing also the emissions associated with this consumption adds an important extra dimension to any policy consideration. The broad approaches of either closing the distance between production and final consumption or, alternatively, reducing the demand for new production are appropriate here. As an initial assessment, the list below suggests broad areas for intervention, with brief examples of existing policies where appropriate.

- **Rights to reuse, repair, reprogram:** already gaining traction, including in the US state of Massachusetts and in the EU and UK, a statutory "Right to Repair" can prevent manufacturers locking users and third-party repair services out of their products. Massachusetts has a longstanding "Road Vehicle Owners Right to Repair Act", passed in 2012. Amongst its provisions, car manufacturers are compelled to provide manuals and other technical information to enable owners and independent mechanics to repair vehicles. New York State's "Digital Fair Repair Act", passed in 2023, requires manufacturers of electronic equipment, including mobile phones, to make similar provisions to owners and the general public, enabling them to make repairs on hardware as they see fit.[11]
- **Financial support for local repair, reuse, reprogram**: encouragement for third-party repair and for the resale of pre-owned products, including tax cuts (e.g. VAT reductions). Austria has a "repair voucher" scheme, established in 2022, which allowed households to claim back up to 50% of the cost of a repair to an appliance, up to the value of €200. Financed through the country's Covid Recovery Fund, initial assessments suggest a significant change in behaviour, with 40% of pilot scheme users reporting they would not

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[11] Irene Calboli, "The Right to Repair: recent developments in the USA", *WIPO Magazine*, 1 August 2023. The Right to Repair: Recent Developments in the USA

have used repair services without it.[12] France and a number of German Lander have enacted similar laws since 2021.[13] The EU has now adopted a Right to Repair Directive (2024/1799) that will require manufacturers of a range of goods to provide repairs beyond the liability period, amongst other requirements.[14]

- **Tariffs on shipping distances and weights:** heavier goods, travelling longer distances could be penalised by at-the-border tariffs, altering a charge depending by weight and distance travelled.
- **Non-tariff regulations on supply**: conditions placed on the sale of goods could include requirements for guaranteed product lifetimes, or the provision of detailed hardware guidance online, allowing repair and reprogramming.

A next stage of the project here is to provide some more robust numbers on the potential for GHG reductions through the circular economy methods, and to provide some estimates for the costs of policy measures needed to support them. We would also look to research second order impacts – back along the supply chain, to raw and semi-processed material inputs like steel, and then in the other direction, to the GHG transport costs of moving goods out of seaports and onto road or rail.

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[12] Restart, "What we're calling for in the Repair and Reuse Declaration", 20 October 2023. What we're calling for in the Repair and Reuse Declaration - The Restart Project

[13] Katrin Meyer, Magdona Molnar, "A comprehensive overview of the current repair incentive systems: repair funds and vouchers", Repair.Eu, 11 March 2024. A comprehensive overview of the current repair incentive systems: repair funds and vouchers - Right to Repair Europe

[14] Candido Garcia Molyneux, Anna Sophia Oberschelp de Meneses, "The EU Adopts Right to Repair Directive", *Inside Energy and Environment*, 10 June 2024.

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