Task Force 5
2030 Agenda and Development Cooperation

Policy brief

AVAILING EXISTING FRAMEWORKS TO ENABLE A CLEAN AND SUSTAINABLE TRANSITION IN THE TRANSPORT SECTOR

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ABSTRACT

While there is an immediate need to tackle global environmental issues, the decarbonization of the transport sector represents a key challenge at the policy level and in particular the financial and environmental sustainability of this process. This is of critical importance not just for the G20 but the non-G20 world also.

Decarbonization poses a significant challenge as countries and organizations try to manage the energy transition to cleaner fuels. Therefore, it is essential to take lessons from policies and institutions that are offering support for the energy transition in other sectors. For example, the G20 Transport Task Group should help develop policy mechanisms such as the circular carbon economy to foster a painless transition to zero-carbon fuels.

Globally, several organizations regulate shipping without an overarching statutory organization or body having the expertise and financial strength to manage emerging risks (financial, operational, policy and regulatory) that will result from the transition to zero-carbon fuels.

CHALLENGE

The decarbonization of the transport sector has been a critical priority for policymakers globally due to its significant contribution to GHG emissions. Globally the transport sector emits around 24% of the total energy-related CO_2 emissions (Pangestu, 2021). Emissions from vehicles cause urban air quality to deteriorate. This deterioration negatively impacts on the goals under SDG11, to "Make cities inclusive, safe, resilient and sustainable", on sustainable cities and communities and delays the fulfilment of climate action goals under SDG 13, "Take urgent action to combat climate change and its impacts".

A more sustainable mechanism needs to be incorporated. The challenge is to execute the transition while ensuring that transport sectors' decarbonization doesn't create efficiency and innovation islands in some countries but is more broad-based globally in line with SDG17, "Strengthen the means of implementation and revitalize the global partnership for sustainable development".

With technology evolving to enable energy transition, there is an urgent need to explore ways to make marine fuels compatible with the SDG targets and frameworks. Supporting this transition would facilitate business innovation and leadership in this space, which is of critical importance not just for the G20 but also equally important in the post-COVID era of supply chain diversifications for the non-G20 world.

PROPOSAL 1

Policy measures are required to build on the idea of the 4Rs of the circular carbon economy (CCE) – reduce, reuse, recycle and remove – for the efficient management of carbon emissions from heavy-duty vehicles (HDVs).

RATIONALE

HDVs account for 40% of CO_2 emissions from transport and a smaller but fast-growing share in the vehicle fleet (ICCT,, 2018). The increasing number of HDVs in the global vehicle parc leads to increasing oil consumption and hence associated CO_2 emissions. Shifting HDVs' reliance on oil to other, non-CO_2, fuels is difficult due to the vehicles' high energy and power density requirement and the lack of alternative technological options (IEA,, 2020a). The dual challenge of meeting the growing energy demand and simultaneously reducing CO_2 emissions from HDVs requires a combination of innovative technologies and policy mechanisms such as the circular carbon economy (CCE). The 4Rs of a CCE – reduce, reuse, recycle and remove – offer a holistic approach to carbon management, which is necessary to reverse negative climate change impacts (KAPSARC,, 2020). Transport decarbonization in road transport and specifically in HDVs can be achieved through a CCE, which offers a strategic and systematic approach to managing carbon emissions.

Reduce: The first R of the CCE reduces carbon emissions by using innovative technologies such as electric or hydrogen-based power trains, improving the fuel efficiency of internal combustion engines, stringent tailpipe emission standards, improving net loading capacities, and in-time vehicle retirement of existing inefficient fleets. These strategies are at the core of the CCE.

Reuse: The second R of the CCE creates economic value by capturing carbon and utilizing it. A great example of this is e-fuels which require CO_2 for production and can be used in internal combustion engines.

Recycle: The third R of the CCE utilizes atmospheric CO_2 to grow biomass, which can be harvested for bioenergy, such as biofuels. Biofuels can play a significant role as an alternative fuel for HDVs in the transport sector.

Remove: The fourth and final R of CCE captures the carbon released in the atmosphere and either removes or reuses it. On-board carbon capture (where the carbon emissions from the vehicle are trapped at the point of emission) is currently being explored to capture carbon while being used in internal combustion engines (Shivom and Maréchal, 2019). Secondly, as the developed world proceeds towards decarbonization and alternative fuels, it will discard its older vehicle fleets. These HDVs usually end up in used vehicle markets in developing countries. This export of used vehicles to the developing needs to be curtailed using policies and incentives and the vehicles themselves should be scrapped in the land of origin. Exports of these used HDVs to developing nations, tend to, in a perverse form, export the problem to other countries, which often don't have either the policy structure or the fuel quality to manage emissions from such vehicles. Lack of maintenance of such vehicles is another issue.

SUGGESTIONS FOR IMPLEMENTATION

The G20 Transport Task Group (G20 TTG) can take the lead in coordinating the measures required to accelerate the implementation of the 4Rs of CCE in HDVs across G20 nations. Reducing emissions from HDVs is also one of the main objectives of the G20 TTG. According to the IEA report on trucks and buses, only six G20 members (China, the United States, the European Union, India, Japan and Canada) sold new HDVs with approved fuel efficiency standards in 2019 (IEA,, 2020b). For the rest of the G20 members (excluding the six mentioned above), either there are no standards or standards are in the process of development. The G20 TTG can guide and share best practice among G20 members to promote fuel efficiency standards. Moreover, having stringent tailpipe emissions standards would reduce carbon and help improve the local air quality, which is becoming a significant threat to public health in countries like India and China with very high urban population density.

Biofuels can play an essential role in decarbonizing HDVs, supporting developing technologies such as electric and/or hydrogen vehicles for the long-term decarbonization of HDV fleets. In addition, biofuels can be directly used in internal combustion engines without significant upgrades. However, the market price is the biggest barrier to the large-scale adoption of biofuels. Therefore, the G20 nations should assess land availability and the associated social risks to utilize the full potential of sustainable biofuels, from either sustainable agriculture or even waste-based biofuels in their energy mix and introduce dedicated policies and innovative financing options to bring down the cost and increase the share of biofuels in their energy mix.

The ongoing COVID-19 pandemic has pushed the world into an economic crisis, and many countries are preparing economic stimulus packages to get their economies back on track. This adjustment offers countries an opportunity to rethink and readjust their pathways for future development. The G20 governments can allocate a part of their stimulus package to invest in technologies like e-fuels and on-board or mobile carbon capture.

The G20 nations should also work on retiring and scrapping inefficient vehicles in the countries of origin; if they fail to do so most of these inefficient vehicles will be exported and sold in the used vehicle market in emerging economies. Such used vehicles are often already paid for as a result of usage and depreciation for the countries of origin. Exporting these used vehicles to emerging economies incentivises the creation of secondary or, in some cases, tertiary used-vehicle markets, where the buyers in such markets focus primarily on the low upfront cost of the vehicle and any fuel efficiency considerations are seldom considered. In addition, G20 nations should use their overseas development aid mechanisms to help support transport infrastructure development, build policy-making capacity, and establish fuel standards and quality fuel supply systems to prevent emissions leakage. As the developed world starts to move towards decarbonizing its transport sector, there will be massive pressure to discard inefficient vehicles by exporting them to the least developed countries. However, this should not be practised, and a policy measure in this regard from the G20 will help immeasurably to reduce used vehicle exports.

PROPOSAL 2

Policy measures are required to finance and build the infrastructure necessary to adopt hydrogen and synthetic/e-fuels for the global shipping industry.

RATIONALE

According to the World Economic Forum's E15 Initiative, effective global trade is "crucial for reinvigorating economic growth and confronting 21st-century global challenges" (World Economic Forum,, 2016, p. 7). Around 90% of world trade is carried by ships (Wang, Haifeng, 2014). However, shipping also creates colossal pollution through its hazardous emissions. SO_x emissions from ships have been recognized as a significant threat to the global environment, highly destabilizing extremely vulnerable ecosystems such as the polar region near the Arctic Sea, leading to the International Maritime Organization's IMO2020 mandate of a sulphur cap on marine fuels. To align itself to Paris climate goals, the IMO has outlined its 2050 vision to reduce CO_2emissions by 50% by 2050 (from base levels in 2008) (IMO 2020).

Maritime transport, accounting for 2.5% of global GHG emissions (Englert, Dominik; Losos, Andrew, 2021), is a challenging sector in terms of transition to lower emissions intensity because of the currently insufficient technological feasibility of mass electrification of this mode of transport. Hence, reducing emissions from shipping in the future and enabling a lower carbon footprint of this sector requires a careful selection from the available fuel options.

Synthetic fuels offer a promising alternative for low carbon and less air pollutants emissions from long-haul shipping. Synthetic fuels (or electro-fuels) can be made from the chemical conversion of carbon dioxide (captured) and hydrogen (from the electrolysis of water utilizing green electricity) into fuels such as e-methane, e-methanol, dimethyl ether (DME), e-petrol, e-kerosene and e-diesel. The technology of e-fuels (e.g., Fischer Tropsch or methanol synthesis) is well established and commercially matured. These fuels are sulphur and heavy metal-free and can be designed to reduce black carbon reductions. The volumetric and energy density is comparable to existing marine fuels like HFO and distillates (e.g., diesel, MGO, MDO) and can be readily used as "drop-in" replacements or blends. The bunkering infrastructure and architecture of marine propulsion engines may need slight modifications to enable the large-scale deployment of synthetic fuels. However, the scale at which an e-marine fuel needs to be produced for the defossilization of marine fuels makes this plausibly a distant scenario.

Apart from synthetic fuels, liquefied hydrogen and ammonia can also be part of a defossilized fuel mix for the shipping industry. The World Bank's study on decarbonizing the shipping industry highlights (green) ammonia and (green) hydrogen as possible front runners for zero-carbon bunker fuels in the future with green ammonia edges out hydrogen due to better handling capabilities and ready acceptability by mariners (Englert, Dominik; Losos, Andrew, 2021).

The manufacturing of synthetic fuels can benefit from the co-location of renewable electricity to produce clean hydrogen/methane and a source of captured carbon dioxide. Hence a green hydrogen/green ammonia production hub near major bunkering facilities is the desirable proposition.

SUGGESTIONS FOR IMPLEMENTATION

Even though emissions because of shipping (percentage of total GHG emission) is not huge, it has grown faster than other GHG contributors (along with aviation). The bulk of the marine shipping industry is commodity transport with regional bunkering hotspots across the world. Five key bunkering locations contribute to about 60% of all bunker sales in the world – Singapore, Fujairah (UAE), Rotterdam (Netherlands), Hong Kong (China) and Antwerp (Netherlands) (Ban et al., 2015). This unique feature of the industry and the structural changes to existing supply chains in a post-COVID-19 world can foster the early adoption of environment-friendly fuel sources. HFO (79% share of bunker fuel (Englert and Losos, 2021)), distillates, and LNG (21% share of bunker fuel (Englert and Losos, 2021)) can be progressively replaced by e-methanol, e-methane, e-diesel, liquid hydrogen, or ammonia in a judicious energy mix best settled by economics and geopolitical factors. However, the challenge lies in enabling innovative policy support with financial incentives (in addition to technological innovation) to support the transition and preventing costly technology choices that can increase the risk of stranded assets, given long project timelines and heavy capital investments.

A recent World Bank study (Englert and Losos, 2021) stated that about $1 trillion in future investments was needed to transition to zero-carbon fuels by 2050 (the IMO target alone, while total decarbonization could be double that amount). Even as the IMO continues to lead the global mandate to transition the global maritime industry to zero-carbon fuels, an international level strategy with an actual outlay for public investment would help the industry align its long-term investment plans to facilitate a smooth transition. Support from the relevant governments could be in the form of an infrastructure investment tax holiday (87% of investment is expected to be for inland infrastructure like storage tanks, fuel loading and support equipment, while only 13% is on ships) or priority rates for infrastructure investment or viability gap funding, targeting one of the proposed zero-carbon fuels especially by the top five existing bunkering hotspots (outlined earlier). However, the presence of an entrenched bunkering ecosystem may prevent the switch to a newer ecosystem in these countries. Developing countries may take advantage of resetting global supply chains to attract investment in new bunkering infrastructure development. Zero-carbon fuels with lower energy density would entail more frequent refuelling; hence the need to develop new port/bunkering infrastructure is not a farfetched idea.

Another factor that could potentially support the transition faster is a global carbon price, suitable for reducing carbon emissions from other sectors, and G20 can facilitate setting up mechanisms for global price discovery markets and trade in carbon. A carbon pricing would incentivize the high emitters in the shipping industry to incorporate zero-carbon fuels faster and invest in fleet changes that are compatible with zero-carbon fuels, thereby creating a demand which would accelerate the supply infrastructure.

The World Bank has launched the Global Facility to Decarbonize Transport (GFDT), a trust fund focused primarily on transport decarbonization (Pangestu, 2021). However, its remit is primarily to look at overall transport. The G20 nations should focus on creating a parallel international body focused on financial issues from a maritime perspective complementing the work of the IMO but with more significant financial capabilities. This body could, in theory, help with bridge financing at discounted rates for public investment in new zero-carbon bunkering infrastructure creation. This could also be a body under the auspices of the G20 Transport Task Group (G20 TTG) and could help mitigate financial risks by developing and building infrastructure and scale up support services. As the timeline for the development of clean fuels and building scale to meet the expected demand for these fuels is short, it will be a challenge; it would be prudent to help develop an organization that has a focused mandate on the shipping industry, with the combined might of the G20 and also with specialist expertise in pricing risks (associated financial and non-financial risks) of the proposed energy transition into a SPV (Special Purpose Vehicle) built especially for the purpose. This will become more and more critical as standard financial intermediaries start to retreat from the maritime fuel market, posing essential risks of supply to the global shipping fleet. New lines of credit could become hard to find, and the transition can potentially risk global economic growth.

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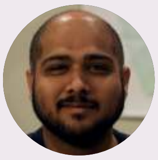

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