The BC-SMART Low-Carbon-Intensive-Fuels (LCIF) Consortium

Decarbonising Long-Distance Transport

Newsletter Issue 3, January 2021

In this Issue

Picture credit: Vancouver Fraser Port Authority

From the BC-SMART Secretariat

How do we decarbonise long-distance transport while facilitating post-COVID economic recovery?

Last year (2020), we saw unprecedented changes in business, governance and our daily lives due to the COVID-19 pandemic. Though the final figures are yet to be tallied the IMF predicted (in October 2020) that global GDP would shrink by 4.4% in 2020 while projecting that economic recovery would be "long and difficult". However, several "silver linings" have evolved. For example, several vaccines have been approved with significant vaccination campaigns underway globally, stock market indices are at record

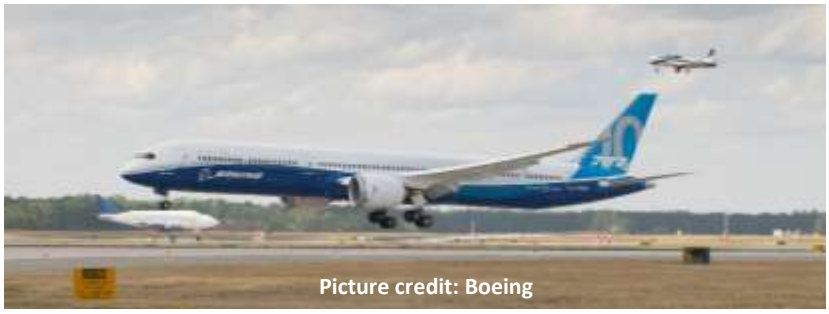
highs, (with the Dow Jones over 30,000) while ongoing low interest rates have resulted in a global house-buying boom!

At the same time 2020's GHG emissions are expected to be about 7% lower than they were in 2019 (World Economic Forum, 2020) and, according to some estimates, ground transportation emissions decreased by about 40% in the first half of 2020 (Zhu et al. 2020, Potsdam Institute for Climate Impact Research, 2020).

Despite the enormous disruption caused by COVID-19, as the world recovers, there is a global desire to establish a more sustainable and equitable socio-economic society. Thus, the long-distance transport sector, which is both a driver of economic growth and a substantial GHG emitter, has a unique opportunity to play a vital role in the world's recovery and realignment.

How did the long-distance transport sectors fare in 2020?

It goes without saying that the **aviation sector** has been hit particularly hard by the COVID-19 pandemic. Compared to 2019, global passenger traffic in 2020 is likely to have decreased by 2.8 billion and estimates of revenue loss could be more than $350 billion (ICAO, 2021). Direct aviation job losses may be as high as 4.8 million (Airlines, IATA, 2020). One "silver-lining" is that aviation's GHG emissions decreased by about 200 $MtCO_2$ in the first half of 2020, a 43% drop compared to 2019 figures (Zhu et al. 2020). Although not as dramatic, the **marine sector** is forecasted to suffer a 4.1% reduction in global trade (UNCTAD, 2020). In total, over 40,000 job losses are expected throughout the shipping sector over the next 3-5 years (Ovcina, 2020), while GHG emissions decreased globally by about 25% or 89 $MtCO_2$ in the first six months of 2020 (Zhu et al., 2020). **Rail and trucking** were also impacted by COVID-19 with Canada particularly reliant on rail and trucking for ground transport. In 2020, Canada rail freight dropped by 7.1%,



Picture credit: Boeing

compared to 2019, (Statcan, 2020), while trucking is projected to lose $3.2 billion in revenue in 2020 (Ontario Trucking Association, 2020).

The path forward: how to develop a sustained but low-carbon global recovery?

As we recover from the impacts of COVID-19 it is clear we need to catalyse the global economic recovery while ensuring ongoing decarbonisation. Strong arguments have been made by groups such as McKinsey who have highlighted government investment in clean energy and energy efficiency as top priorities (Cassim et al. 2020). For example, leveraging the expertise and experience of the long-distance transport sector and catalysing their recovery and growth while decarbonising their operations. Aviation alone contributes nearly $700 billion to the world GDP (higher than some G20 countries) while supporting more than 85 million direct and indirect jobs (ATAG, 2020). The long-distance transport sector also has the infrastructure and know-how to significantly influence economic growth. However, the sector accounts for a substantial amount of the world's GHG emissions, with the aviation and marine sectors responsible for 4-6% or nearly 2 billion tonnes of global emissions. With economic recovery, the GHG footprint of the long-distance sector is expected to increase with the marine sector alone projected to be responsible for 17% of all emissions by 2050. Although the long-distance sector requires decarbonisation solutions that can be implemented right now it is dependent on long-lived, capital-intensive infrastructure and assets such as aircraft and ships. Planes, ships, trucks and trains and the overall long-distance supply chain, will require a substantial lead-time to innovate, design, manufacture and commission low carbon alternatives. For example, any potential "low-carbon" ship must already be in the innovation and decision-making phase and in the water by 2030 if the marine sector is to meet its 2050 GHG emission targets (Pers. Comm. Lee Kindberg).

Picture credit: Vancouver Fraser Port Authority

The potential role of drop-in biofuels in a low-carbon recovery

However, it should be noted that several drop-in biofuels are already commercial, such as renewable diesel, and are providing low-carbon fuels and have created well-paying jobs. For example, biofuels have the potential to create 15-30 jobs per million $ invested with organizations such as the IEA and the Biofuture Platform advocating for investment in biofuels and the overall bioeconomy as pillars of post-COVID recovery (Biofuture, 2020). Additionally, most of these drop-in biofuels are fully compatible with many aspects of the existing petrochemical infrastructure.

Picture credit: Canola Council of Canada

Although, of the four long-distance transport sub-sectors (Marine, Aviation, Rail, and long-distance trucking), aviation seems to have its decarbonisation strategy most defined, it is the sector that has been most impacted by COVID-mediated disruptions. Thus, it is likely that it will take several years before things get "back to normal" for the aviation sector. While initiatives such as flying more energy-efficient fleets, decarbonising airport operations, more efficient flight paths, etc., are all being explored, the use of more sustainable aviation fuels (i.e., biojet fuels) is widely recognised as providing the best short-to-mid-term decarbonisation solution (IATA, 2020; van Dyk et al. 2019).

For shipping, as well as biofuels, various options are being explored, including electricity/batteries, LNG, ammonia, hydrogen, etc. However, these alternatives come with their own challenges and limitations. For example, while hydrogen is energy-dense on a mass basis, it is about 5-times less energy-dense than fossil marine fuels on a volume basis. Thus, any future hydrogen-fueled vessels will have to install large fuel tanks for international operations. Currently ,the lack of focus on one or a set of particular options is confounding matters with organisations such as Bloomberg reporting that ship orders have

> ***"If we don't get our act together, we will still be talking about ten different fuels when the deadline flies by"***
>
> Shipping Operator (quote from Shell-Deloitte, 2020)

dropped by 50% because of ship owner's uncertainty about which low carbon fuel to use (Low and Wittels, 2021). It is apparent that decarbonising long-distance transport will not be easy and any solutions will require a concerted effort by all stakeholders.

The BC-SMART low-carbon-intensive-fuels (LCIF) Consortium is a "coalition-of-the-willing" of industry, government and academic stakeholders that are committed to this effort. As summarised in this issue of the BC-SMART newsletter, we are fortunate to work with leaders in the long-distance transport area. While future newsletters will profile the progress being made by the aviation, rail and trucking sub-sectors, as demonstrated in the recent BC-SMART and IEA Bioenergy Task 39 joint webinar and, as summarised here, good progress is being made by the global marine sector in not only dealing with air quality (e.g. sulphur emissions) but also in reducing their overall carbon footprint.

Picture credit: Vancouver Fraser Port Authority

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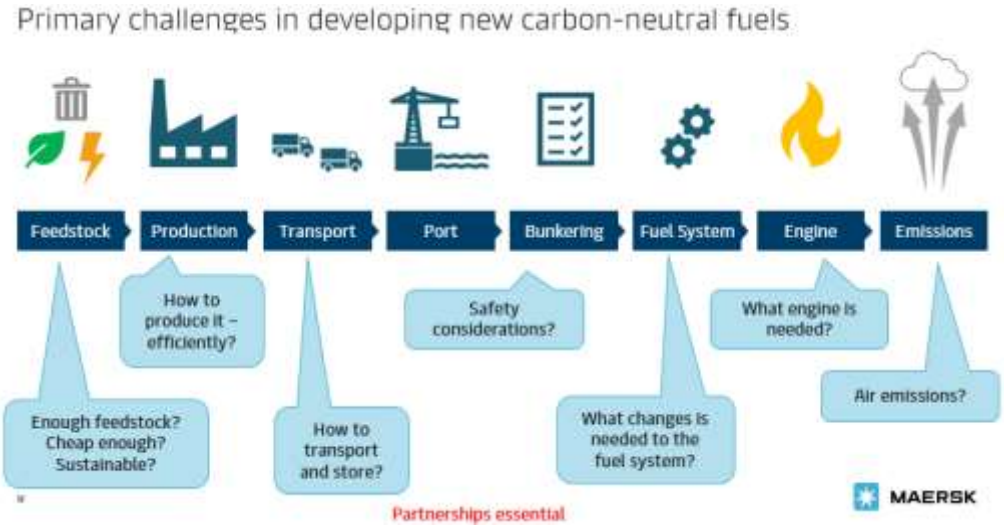
BC-SMART – IEA Bioenergy Task 39 Virtual Panel Discussion, December 2020

Decarbonising the Marine Sector: Progress and Aspirations

On December 03, 2020, BC-SMART, IEA Bioenergy Task 39, and BC Bioenergy Network (BCBN) held an informative webinar entitled, "Decarbonising the marine sector: Progress and Aspirations?" with about 120 registrants in attendance.

Despite the widespread economic turmoil resulting from the COVID-19 pandemic, the shipping sector continues to contribute to about 80-90% of global trade, employing millions globally and has been aptly described as the "lifeblood of the global economy". However, while shipping is generally recognized as a cost-effective, lower carbon-intensive mode of transport, it still accounts for more than 900 million tonnes (2-3%) of annual global GHG emissions as well as large amounts of sulfur and particulate emissions. The webinar benefitted immeasurably from the presentations of a panel of global leaders including, **Christine Rigby (Vancouver Fraser Port Authority), Lee Kindberg (Maersk), Dirk Kronemeijer (CEO and Founder, GoodFuels and the GoodShipping Program), Dayne Delahoussaye (Neste)** who were ably moderated by **Peter Lister (Seaspan).** The speakers represented ports, shipping lines, lower-carbon fuel producers/suppliers, etc., who are well aware of renewable fuel policy developments and sector decarbonisation aspirations.



(source: Lee Kindberg, 2020)

The panel highlighted several factors that will be critical if we are to successfully decarbonise the marine sector. Although it was recognised that biofuels will play an important role in decreasing the sector's emissions, and continuing progress in the production and use of low-CI biomarine fuels is anticipated, several challenges will need to be resolved before their wider use. These include the limited volumes/availability of these fuels, the cost of potential feedstocks and overall logistical challenges. All of the panel members highlighted that strong policy support will be needed to incentivise and de-risk the marine sector's decarbonisation effort. The webinar participants logged in from North America, South America and Europe and the informative discussion was only limited by time and time differences! The list of panel members and their short bios, meeting minutes, and a recording of the panel discussion are available at the BC-SMART website (link).

A success story: The Port of Rotterdam and how it is contributing to establishing a low-carbon intensive bioeconomy

The Port of Rotterdam (PoR) dates back to its origins as a fishing port in the 15th century (porteconomicsmanagement.org). Today it is the largest port in Europe, handling nearly $500 million tonnes of cargo, close to 30,000 sea-going vessels each year (2019 figures), with total direct and indirect employment estimated at 385,000 people. Although the Port has been a key component of the established fossil economy, today it is also a leader in the Bioeconomy. For example, the April 2020, Ship & Bunker reported that biofuels comprised 11% of fuel oil sales at the Port.

The Port is home to biofuel feedstock handlers (ADM, Loders Crocklaan, Wilmar), biofuel producers (BioPetrol, LyondellBasell, Neste, Alco), and blenders & distributors (Vopak, Shell, BP). Initially the biofuel "components" arriving at the Port were rather disjointed, with products originating in Asia (Singapore, Malaysia) and the US arriving at the port prior to being forwarded on to demand centers across Europe, in Sweden, Spain, France and the UK. However, information regarding overall sustainability was lacking mainly because the complex, multi-stakeholder supply chain was hampered by uncertainties related to demand fluctuations and unharmonized regulations across Europe. The Port of Rotterdam took a

leadership position and, in cooperation with several stakeholders, orchestrated stakeholder cooperation, integrated the supply chain and turned the port itself into a logistics hub and a bio-industrial cluster.

The types of initiatives that were undertaken included reserving and allocating land for bio-facilities, direct investment and, in close collaboration with companies and universities, establishing a knowledge center and a bio-industry cluster consisting of biofuels, biochemicals and bioenergy components. Currently, five (5) major biofuel producers located at the port supply about 2 million tonnes of biofuel per year. In parallel, two (2) biochemical companies produce various chemicals, including esters and fatty acids, while the Port generates much of its own "clean" electricity co-firing biomass with coal in some of its power plants (Bio Industry, Port of Rotterdam). In summary, the Port of Rotterdam has organised and coordinated a group of more than 45 chemical companies, five (5) crude oil refineries, four (4) vegetable oil refineries, and three (3) biofuel plants into a very effective bio-cluster (Port of Rotterdam, 2015, Effting, 2020). This co-location and interdependency has facilitated the establishment of an effective supply chain by, for example, directly sourcing feedstock from neighbors or by repurposing the products/residues of one company as the feedstock for other companies (Port of Rotterdam, 2015).

The Port of Rotterdam is just one example of an organization who used to be highly dependent on fossil fuels is transitioning to becoming a major player in the establishment of a lower-carbon-bioeconomy.

Webinars and Conferences

IEA Bioenergy Webinars

- IEA Bioenergy Webinar (November 2020) IEA Renewables 2020 main findings (click to watch).

- IEA Bioenergy Webinar (November 2020) The contribution of renewable fuels to road transport decarbonisation (click to watch).

Biofuel Digest's DigestConnect

- Biofuels Digest (January 2021): Renewable diesel, scaled to feedstock. Biofuels Digest editor Jim Lane discuss with Adam Belyamani, COO of Saola Energy and Valerio Coppini, VP Business Development of NextChem (click to watch).

- DigestConnect#20 (January 2021): 50 Hottest Companies in the Advanced Bioeconomy - Fuels & Chemicals: Biofuels Digest editor Jim Lane announces the Hot 50 list (click to watch).

- DigestConnect#30 (November 2020): Cellulosics: Biofuels Digest editor Jim Lane discusses 1G/2G biofuels with Clariant's Paolo Corvo and Chemtex's Jeff Taylor (click to watch).

- Biofuels Digest Webinar (July 2020): Port of Rotterdam: Opportunities in renewable fuels and chemicals at the port (click to watch).

Virtual Bioenergy Symposium, Biomass Energy Network, University of Alberta

- Virtual Bioenergy Symposium: Bioenergy Initiatives of the Mexican Petroleum Institute – Dr. Jorge Aburto, Mexican Petroleum Institute (December 2020). (click to watch)

- Virtual Bioenergy Symposium: How to Grow Alberta's Low-Carbon Energy Future – Perry Toms, CEO, Steeper Energy (October 2020). (click to watch)

In the News

- January 2021 – Boeing committing to deliver commercial airplanes that can fly on 100% sustainable fuels (Read more)
- January 2021 – Biofuelsdigest's Hot 50 companies leading investments (Read more).
- January 2021 – Biofuels Digest: The Digest's biofuels mandates around the world 2021 (Read more).

- January 2021 – Biofuels Digest: DigestData DeepDive into Renewable Energy Group, the largest operator of renewable diesel and biodiesel plants in the US (Read more)
- January 2021 – Biofuels Digest: Drop-in Sustainable Aviation Fuel: The Digest's 2020 Multi-Slide Guide to Red Rock (Read more)
- December 2020 – Biofuels Digest: SAF takes off to the next level: Efforts by United, Boeing, Etihad, World Energy, and Gevo (Read more)
- December 2020 – TFG Marine, a joint venture by Trafigura, Frontline, and Golden Ocean Holdings, plans to offer a range of biofuels in the ports of Amsterdam, Rotterdam and Flushing starting 2021 (Read more).
- December 2020 – In Canada, the Ontario government is requiring 15% renewable content in regular-grade gasoline (Read more).
- December 2020 – $35 million funding from the US Department of Energy (DOE) for bioenergy research and development (Read more).
- December 2020 – International Civil Aviation Organisation (ICAO) has recognised Roundtable on Sustainable Biomaterials (RSB) to certify Sustainable Aviation Fuels (SAFs) for Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) eligibility (Read more).
- December 2020 – Neste MY Sustainable Aviation Fuel to be available at the Schiphol Airport, an outcome of Neste acquiring a minority stake in Aircraft Fuel Supply B.V. (AFS) who owns and operates the Amsterdam Airport Schiphol fuel storage (Read more).
- December 2020 – In Romania, Clariant reports good progress in constructing its cellulosic ethanol production plant in Podari (Read more).
- December 2020 – Biofuels Digest: Enerkem, Shell, Suncor and Proman are proposing a $669 million, 125 million litre/year biofuel plant in Québec. The plant would use non-recyclable waste and wood waste. The project also proposes renewable hydrogen and oxygen production facilities long with an 87-megawatt electrolyzer that would use Quebec's green electricity (Read more).

- December 2020 – In France, Air France KLM Martinair Cargo has launched the Cargo SAF Program that enables freight forwarders and shippers to reduce the carbon footprint of shipments (Read more).
- November 2020 – In the Netherlands, GoodFuels and Volkswagen Group have partnered to decarbonise marine car transport. The car carrier Patara with VW cargo will be fueled by GoodFuels' advanced Bio-Fuel Oil which reduces both CO_2 and SO_x emissions (Read more).
- November 2020 –Bioénergie La Tuque (BELT), Neste, and the Council of the Atikamekw Nation to receive $4.55 million from the Quebec government to develop and demonstrate forestry waste to advanced biofuels (Read more).
- November 2020 – Sustainable aviation fuels (SAFs) are part of the U.K. government's plan for a green industrial revolution (Read more).

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