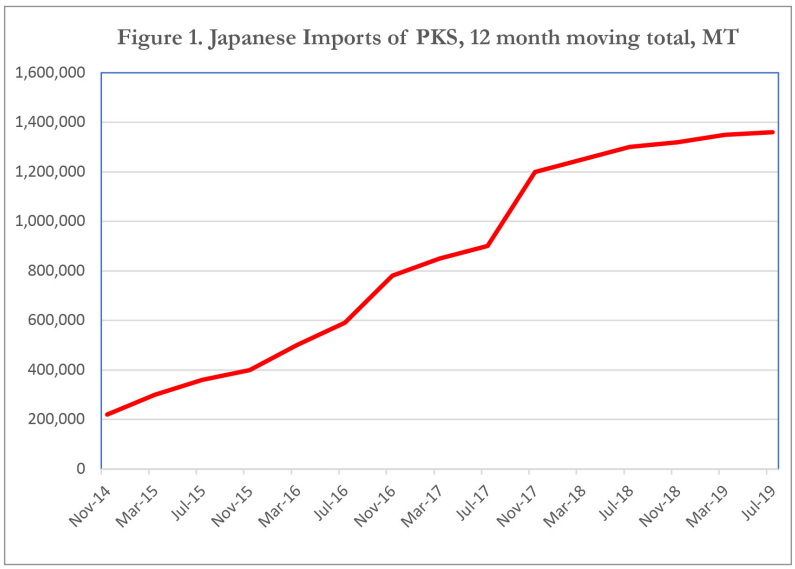
What is the **cost of carbon?**

Inspiring the next "material revolution" by creating sustainable and high-performance materials from oil palm waste, **Peter Fitch** together with IOI have set up IOI Palm Wood to commercialise this untapped potential.

The short answer: the Obama administration introduced the first estimated 'social cost of carbon (SCC)' and it was US$43 a tonne. The Trump administration's estimate was $3–5 a tonne, and the Biden administration's current estimate is around $51 a tonne.

The SCC is arguably the single most important concept in the economics of climate change. It represents the marginal social damage from emitting one metric tonne of carbon dioxide-equivalent at a certain point in time. According to standard economic theory, it represents the price that should be put on CO2 to reduce emissions to socially optimal levels along the optimal emissions trajectory. The SCC has been highly influential in forming climate policy.

Global carbon emissions must drop 7.6% year-on-year from 2020 to 2030 to keep temperatures from exceeding 1.5°C. This was the declaration made by leaders at the Paris Climate Accord. At the time of going to press we are not aware of the commitments made



at the COP26 Conference in Glasgow. However, recent reports claim that currently we are heading for a 3°C global rise in temperatures, if the reduction in carbon emissions cannot be accelerated.

If we focus on what Japan is doing to cut their carbon emissions, we may gain clues as to what other Asian countries can do going forward. Key to any climate change policy is the reduction in the use of fossil fuels. In Japan, almost 56% of the electricity generated still uses fossil fuels such as coal and oil. This will need to be reduced to near zero by 2030 if targets are to be met. The renewable energy theme is dominated by hydro, wind, solar, biomass and geothermal. What interests us here is the use of biomass as a fuel.

Biomass fuel is a renewable energy source made from biologically derived organic raw materials such as wood, plants, branches, leaves and the by-products from agricultural waste. Biomass fuel can be defined as a 'carbon-neutral' fuel because the CO2 captured during the photosynthesis growth offsets the CO2 discharged when the fuel is being burnt.

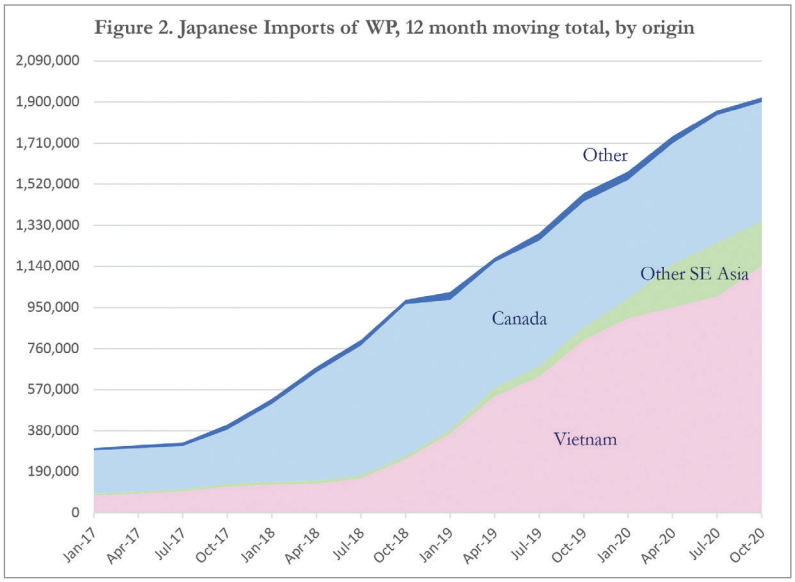
Biomass is being increasingly used in power plants in Japan as a source of fuel. Palm kernel shell (PKS) has emerged as the favourite choice of biomass-based power plants. This is because PKS was one of the cheapest biomass fuels and is available in large quantities across South East Asia. PKS, a biomass waste generated by palm oil mills, can be found in plentiful quantities in Indonesia, Malaysia and Thailand. Some of the advantages of using PKS are that it has a high calorific value of 3,500-3,800 kcal/kg, low moisture content and can be easily stored. We have seen a rapid increase in PKS imports to Japan between 2014 and 2017. Since 2017, the growth of imports of PKS to Japan has slowed significantly to between 1.2 and 1.4 million metric tonnes per annum (Figure 1).

The sourcing of additional volumes of PKS to fuel the rapid growth of biomass generation in Japan could prove challenging, and will become increasingly costly for investors. The cost of PKS at the point of use ranged between $1,250 and $1,500 per metric tonne in 2021, which is sharply up from the price of $500-800 per metric tonne in 2019. This will push end users to look for alternative biomass sources, and I predict this will drive the demand for wood pellets (WP) and other biomass fuels.

Japanese biomass demands continue to grow, and upcoming policy changes will only accelerate this growth. Japan already uses WP, and if we look at the importation figures from 2017 to 2020, we see that the importation volume has increased significantly from 38,000 metric tonnes to 1,900,000 metric tonnes, already exceeding the overall volume of PKS (Figure 2). This is no coincidence and is directly related to the difficulty in securing additional PKS supply. WP have a similar calorific value to PKS but have addition costs associated with their usage such as the need for size reduction, drying and covered storage. There are other biomass fuel alternatives such as mesocarp fibre, empty fruit bunches, palm fronds and oil palm trunks. All these alternatives have unique challenges such as harvesting, drying, high ash content, sizing, handling, and storage. So, in the near future WP will remain the next best option to using PKS.

Since 2020, Japan's Ministry of Economy, Trade and Industry has approved nearly eight gigawatts of biomass electrical

Palm kernel shell (top) and wood pellets (bottom)



Source: Hawkins Write Research

generation capacity under the Feed-in-Tariff (FIT) scheme. Not all of the 70-plus projects may make it to generation, but even conservative figures estimate that Japan will need to increase imports of biomass material by 20% per annum to keep up with this increasing demand. Currently, Vietnam, followed by Canada, supplies the majority of wood chip to Japan. Many questions can be asked as to how sustainable this business model is. And where will the additional sources of biomass fuel come from? Many believe this is a prelude to Japan restarting and investing in new nuclear energy plants. At this point we can only speculate.

We will see in Asia a competition developing between wood-based biomass fibre users. Traditionally, the users of this material have been those companies producing engineered panels such as particleboards, medium-density fibreboard (MDF) and oriented strand board (OSB). The 'new kids on the block' will be the operators of biomass energy plants, or as they like to call themselves, renewable energy generators. We have seen a similar scenario play out in Europe, over the past 10 years. Japan will be a case in point for the future direction of renewable power generation in Asia and the need for more biomass-based fuels. Initial demand will come from the more developed countries like Korea and Taiwan and then spread to other Asian nations as they struggle to meet their carbon reduction targets. Future sourcing from Canada or New Zealand, for example, could become increasingly costly as the logistical costs increase. Demand will require new sources of material, and attention will turn to nearby Asian countries such as Malaysia, Thailand and Indonesia to supplement the supply from Vietnam.

The takeaway from this article is that the cost of carbon increases as we move from fossil fuels and are forced to use more 'renewables'. Biomass (timber) will form an important component of these renewables, and as a result will significantly increase in value. Competition for this resource will intensify between the renewable energy producers and bio-composite manufacturers. This is one of the reasons we need to intensify the commercialisation of alternative sources of timber and biofuels. P