

STARBOARD

An Annual Report on the Carbon Footprint
for the Fiscal Year 2019



Presented by Starboard Blue
Verified by Carbon Footprint™

Executive Summary

The purpose of this report is to disclose Starboard's carbon footprint for fiscal year 2019 (June 2018 – May 2019). The report is made public to be completely transparent about Starboard's emissions and role as an industrial polluter.

The information in this report is retrieved from a variety of sources. There were two methods used to calculate the carbon footprint of each product. The first method examined the total dimensions of each product, whereas the second method calculated the mass of the raw materials used. The calculation metrics were developed by the Department for Business Energy and Industrial Strategy (BEIS) and verified by Carbon Footprint™. This third-party verification has certified Starboard under the Carbon Footprint Standard.

The life cycle analysis (LCA) of composite boards, paddles, windsurfing iQFoil 95 and apparel, revealed the relationship between product composition and carbon emissions. Examples of each product were examined to conclude that from 2018, emissions decreased for composite boards by 0.67 kg CO₂, paddles by 1.3 kg CO₂, apparel by 5.56kg CO₂. However, the iQFoil 95 being a new product lacked a model comparison from the previous year.

Concluding that, Starboard's carbon emissions increased from the previous fiscal year, but carbon sequestration methods have continued to improve. The further development of Starboard Blue has a set partnership with SCG to co-develop alternative virgin plastic materials. Over the next 20 years, 30,030 tons of CO₂ will be sequestered by planting 30,030 mangroves in the Thor Heyerdahl Climate Park. The total amount of trees planted could possibly account for absorbing 10 times the amount of CO₂ found to be released by Starboard in 2019. This report will elaborate on Starboard's efforts to lead the way to a climate positive future.

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1.0 Introduction

1.1 Starboard's Mission

"To bring inspiration and innovation to the world of wind and water."

Starboard is a world-leading water sports company that specializes in designing and manufacturing windsurfing, Stand Up Paddleboarding (SUP), foiling equipment and associated apparel. 'Starboard Blue' was founded with a mission to, **"not only to make the best boards in the world but the best boards for the world."**

Starboard Blue hopes to lead and inspire environmental change, to protect the big blue playground that we share.

1.2 Verification And Purpose

This report is verified by Carbon Footprint™, providing a limited level of assurance (as defined by ISO 14064-3) for the GHG inventory of the specified items. The Starboard products examined in this report, were reviewed on several product lines that comply with GHG Protocol Product Life Cycle Accounting and Reporting Standard. The review included;

- Scope of calculation/boundary
- Input datasets and any assumptions made
- Emissions factors used
- Calculation methodology
- Calculation review
- Results



The purpose of this report is to disclose Starboard's carbon footprint for the fiscal year 2019 (June 2018 – May 2019). This third-party verification has certified Starboard under the Carbon Footprint Standard. The report is made public in an effort to be completely transparent about Starboard's emissions and role as an industry polluter.

1.3 Scope Of This Report

This report investigates the Life Cycle Analysis (LCA) of various Starboard products, analyzing their role in emitting CO₂. Furthermore, Starboard's total emitted versus sequestered CO₂ is examined to identify the company's progression towards a climate positive future.

1.4 Methodology

To analysis the life cycle of each product, a 'Cradle to Gate' assessment is used, with the following elements of focus:

1. Raw materials - embodied and transported emissions.
2. Manufacturing - energy associated with the processing/manufacturing of products.
3. Distribution - final distribution to the end customer.

To note; the methodology for this report does not include the product use and the final disposal of the product.

This report will give insight to the following product ranges:

- Composite Boards (Whopper life cycle)
- Windsurf Boards (iQFoil 95 life cycle)
- SUP Inflatable (included in total emissions)
- Wind SUP (included in total emissions)
- Accessories (included in total emissions)
- Paddles (Enduro paddle life cycle, and inclusion in total emissions)

The process used to calculate the products CO₂ emissions, is based upon two methods;

1. Total dimensions of each product (based on a baseline product in each range)
2. Mass of each raw material (excluding product assembly)

Using the first method of calculation (product dimensions), we use a completed assessment for another product in the range. Subsequently, the emissions of production will be calculated based upon total weight, volume or size of the product.

An example: **Total Product Emissions** (kg CO₂e per product)
Size (m²) / Volume (m³) / Weight (kg)

The second method of calculation (raw materials), examines the emissions of each of the board's components. Therefore, the raw materials CO₂ emissions are calculated, and formulated into the equation below:

$$\text{Embodied Emissions (kg CO}_2\text{e)} = \text{Mass (kg)} \times \text{Emissions Factor (kg CO}_2\text{e per kg material)}$$

Subsequently, the raw materials mass (kg) and distance (km) travelled to the production factory (obtained from the journey itinerary which indicates distance and mode of travel) is calculated.

$$\text{Transport Emissions (kg CO}_2\text{e)} = (\text{Mass (kg)} \times \text{Distance (km)} \div 1000) \times \text{Emissions Factor (kg CO}_2\text{e per tonne km)}$$

For the Carbon Footprint analysis, the product assembly is located in two areas; the Starboard headquarters workshop and the production factory. Therefore, a two-stage calculation for CO₂ emissions is used. The first stage focuses on the energy usage at the Starboard HQ workshop over a 12-month period (relating total energy emissions to the energy usage). The second stage is to apportion this use to the production of a SUP or windsurf board, the formula for calculation of the total workshop energy is as follows.

$$\text{Workshop Emissions (kg CO}_2\text{e)} = \text{Energy Consumption (kWh)} \times \text{Emissions Factor (kg CO}_2\text{e per kWh)}$$

Carbon Footprint UK have recommended Starboard to, “select the most appropriate method by which to allocate emissions to product assembly.” For this report, energy is related to the amount of operational time and floor area usage during assembly of the product. The following formula is used to calculate the emissions during assembly, this essentially multiplies the emissions calculated in the first stage.

$$\frac{\text{(Area used for production of one product (m}^2\text{) x Minutes to produce one unit)}}{\text{(Hours of factory operation x 60 (convert to minutes) x Total Factory Area (m}^2\text{))}}$$

Finally, to calculate the emissions associated with product distribution (kg CO₂e) the following is used:

$$\text{Product Distribution Emissions (kg CO}_2\text{e)} = \text{(Mass (kg) x Distance (km) } \div \text{ 1000) x Emissions Factor (kg CO}_2\text{e per tonne km)}$$

The mass of the material load includes packaging materials (kg), the distance takes into consideration the journey itinerary of the load.

1.5 Abbreviations

| | |
|-----------------|---|
| CO ₂ | Carbon Dioxide |
| LCA | Life Cycle Analysis |
| BEIS | Department for Business, Energy & Industrial Strategy |
| GHG | Greenhouse Gas |
| SUP | Stand Up Paddleboarding |

2.0 Life Cycle Analysis

2.1 Reporting On Greenhouse Gas Emissions

The production industry is responsible for directly and indirectly increasing the amount of GHG in our atmosphere. CO₂ contributes up to three quarters of the GHG emissions, therefore plays a vital role in the GHG effect. The GHG effect is when long-lived gases such as CO₂ trap heat waves radiating from the earth's surface, consequently increasing surface temperature (Nunez, 2019). The industrial revolution caused a substantial increase in CO₂ concentration, enhancing the GHG effect and the rate in which the climate is changing. If the climate continues to change at an alarming rate, the earth systems are unable to adapt and restore equilibrium. This could result in mass species extinctions, changes in weather patterns, crop abundance, and an end to human life as we know it.

Starboard is an industrial producer, but by taking responsibility for our CO₂ emissions and implementing strategies for mitigation, we can proudly say we have gone from being part of the problem, to part of the solution. Starboard has developed a set of guidelines to ensure viable mitigation strategies. Starboard Headquarters are in Thailand, and although Thailand laws and regulations do not enforce GHG reporting, Starboard has chosen to lead the way to a climate positive future.

2.2 Development Of Green Technology

'Green technology' is a term used to describe environmentally-friendly technology, considering the biodegradability of the materials used and the life span of the product. Implementing green technology into our production and manufacturing has been an important development for Starboard over the years. Many innovative

designs using recycled materials have decreased Starboard’s carbon footprint and long-term environmental impact of end of life products. Some examples of Starboard’s green technology are;

- *Recycled EVA deck pad*, shifting toward recycled EVA deck pads from 50% post-industrial EVA waste, increasing UV protection and reducing the use of petroleum.
- *The molded core technology* is fused to individually fit each and every Starboard board, providing high strength at the lightest weight and producing zero EPS wastage.

Starboard steers the industry in a positive direction and changes the competition of the game by not only focusing on selling the best boards in the world, but also the best boards for the world.

2.3 Analysis Of Composite Boards, Paddles And Apparel Life Cycle

To calculate the CO₂ emissions associated with Starboard products, the energy usage at the HQ and travel emissions for the period 1st June 2018 to 31st May 2019, are examined with the calculator from www.carbonfootprint.com. The calculator uses the 2019 metrics developed by the Department for Business, Energy & Industrial Strategy (BEIS) for reporting GHG emissions.

To analyze Starboard’s products, this report looks into the life cycle (LCA) of each product, this is called the ‘Cradle-to-gate’ (excludes the usage and end of life).

There are five stages we look out for the Cradle-To-Gate LCA:

1. Material

The production of the raw materials used for the boards.

2. Waste

The production of the raw materials that are left over.

3. Electricity

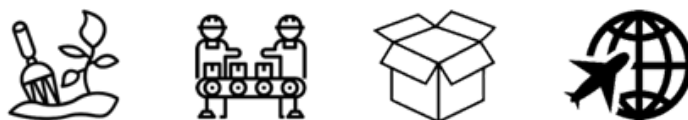
The energy used to produce the boards.

4. Packaging

The production of packaging material.

5. Shipping

The emission from air travel required to ship the boards.



In this section the LCA of composite boards, iQFoil 95, paddles, and apparel are examined. From 2018 to 2019 there have been no changes to the CO₂ emissions of any windsurfing products and inflatable SUP products, so they have not been showcased in this report. However, the windsurfing iQFoil 95 board is included to highlight how our windsurfing division is working to reduce emissions. We expect there will be an influx of iQFoil board usage due to the recent Olympic 2024 selection, therefore we want to share a clear understanding of the product.

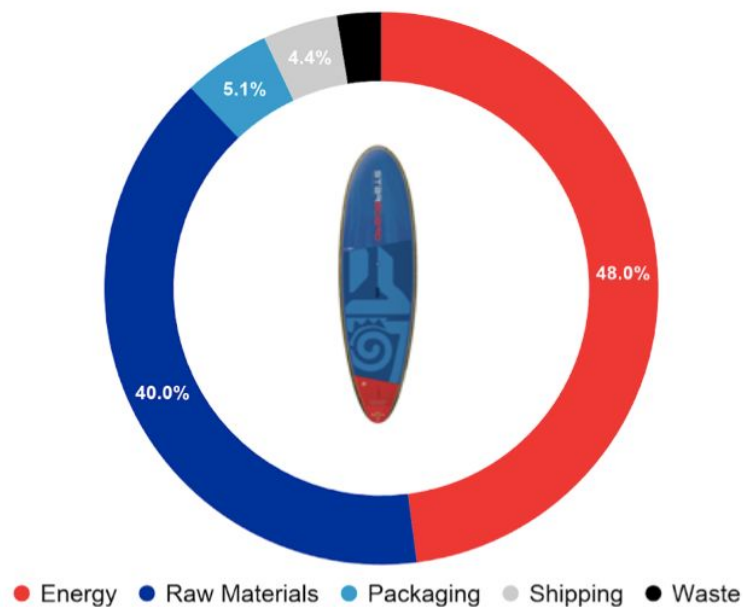
To note that emissions from energy use, packaging, and shipping are approximately the same for each year, so the emission difference is taken from the production of raw materials.

2.3.1 Composite Boards

A composite board generally refers to a foam core board that uses materials such as carbon, glass and/or wood fibers, such as the SUP hardboard range (<https://sup.star-board.com/products/hard-board-overview/>).

In 2019, the Whopper constructed from Blue Carbon technology revealed a total emission of 95.7 KG CO₂ (Figure 1). Comparing this with 2018 there is a 1.94% decrease in CO₂ emissions (Figure 2). The introduction of the carbon-neutral end-grain balsa, significantly reduced the Whopper's raw material emissions.

Figure 1. Diagram showing the percentage makeup of the CO₂ emissions in tons released during the cradle to gate life of a Blue Carbon construction.

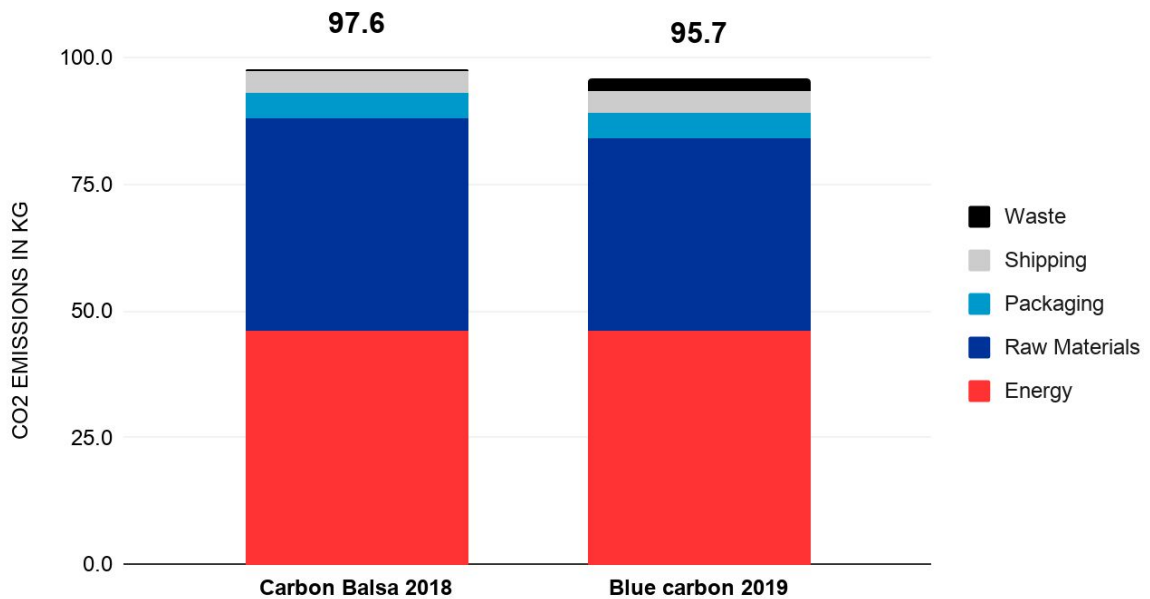


**WHOPPER
BLUE CARBON
TOTAL EMISSIONS: 95.7 KG CO₂ E**

The Whopper is Starboard’s most eco-friendly composite SUP board sold to date, for the following reasons; the use of end-grain balsa, recycled EVA deck pads and molded EPS core technology producing zero EPS wastage. The Whopper EPS core remains at 15kg/m3 density with high strength and lightweight characteristics.

This board showcases the importance of sourcing materials and using green technology to minimize the negative impact board manufacturing has on the environment.

Figure 2. The comparison of emissions of the Carbon Balsa 2018 and Blue Carbon Whopper 2019.

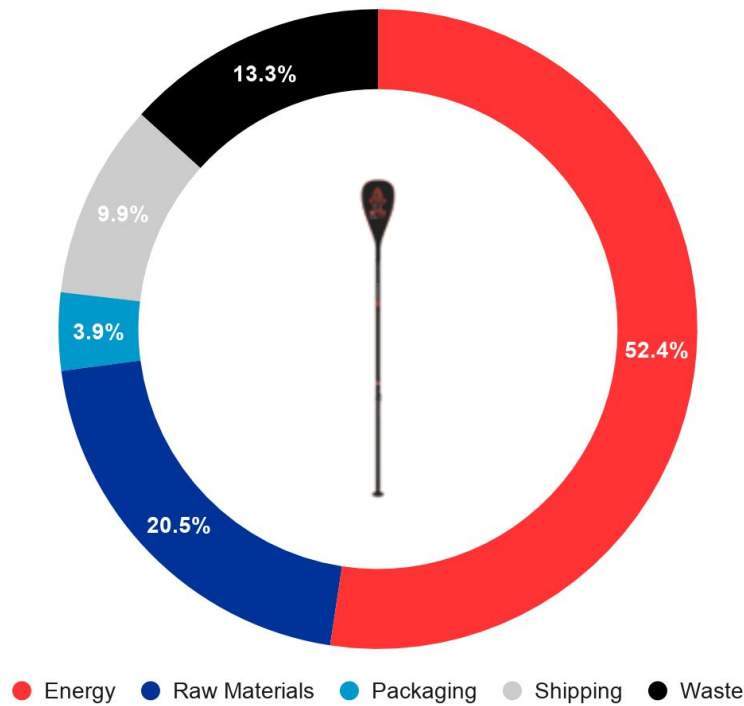


Both the Carbon Balsa 2018, and the Blue Carbon Whopper are the same board with the same construction, but the names have changed between the two years. The graph shows the raw and core materials (includes painting and top coating) CO₂ emissions throughout the Cradle to Gate LCA of both products. Overall, Figure 2 shows a decrease in raw materials, reducing the board weight from 10.512 kg to 9.828 kg, causing CO₂ emissions to drop by 1.94% for 2019.

2.3.2 Paddles

The Balsa Paddle Enduro, demonstrates Starboard’s emphasis on becoming carbon positive. In 2019, the emissions produced by the Balsa Paddle Enduro decreased from 8.81 kg CO₂e in 2018) to 7.50 kg CO₂e in 2019, (Figure 3). This was achieved through waste, raw material reduction, and changing the material from “12k Spread Tow Carbon” to “Carbon UD Flax” used at the pre-mold neck area of the paddle.

Figure 3. Diagram showing the percentage makeup of the CO₂ emissions released during the cradle to gate life of a Balsa Paddle Enduro 2019.



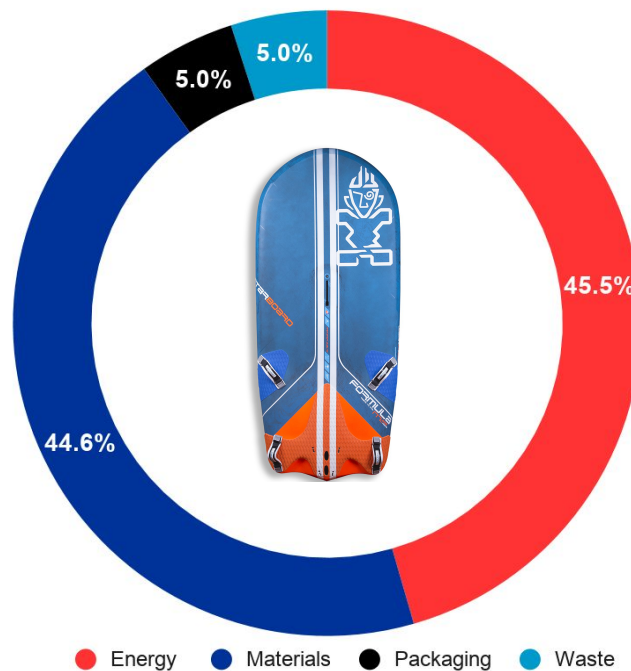
ENDURO PADDLE
TOTAL EMISSIONS: 7.50 KG CO₂ E

2.3.3 Windsurfing iQFoil 95

Starboard's windsurfing range had no decrease in emissions for 2019, but from 2017 to 2018 there was a 6.2% decrease. The iQFoil 95 is highlighted in this report to showcase its environmental impact, because of its selection to be the Olympic windsurfing equipment for 2024.

Starboard's iQFoil 95 is currently in production, it uses standard epoxy resin and produces 99.18 kg CO₂ total emissions. In the future, we hope to use bio-resin with a 33% plant-base, which would decrease the total to approximately 95.74 kg CO₂. Figure 4 shows a breakdown of the board's total emissions, clearly indicating the materials and energy of production are the largest contributors. Starboard's research and development, and product design teams are making large efforts to introduce materials and processes to further reduce environmental impact.

Figure 4: Diagram showing the percentage makeup of the CO₂ emissions released during the cradle to gate life of an iQFoil 95.



iQFoil 95. TOTAL EMISSIONS: 95.74 KG CO₂ E

To contribute to the sustainability goals of the 2024 Olympics, Starboard will take even further steps to reduce the board's footprint to the planet. For each iQFoil board produced, Starboard will plant 10 mangrove trees per each board. Therefore, within the first 20 years of the tree's life they are likely to absorb around 10 tonnes of CO₂, 100 times the amount emitted from the cradle to gate of the iQFoil board's production.

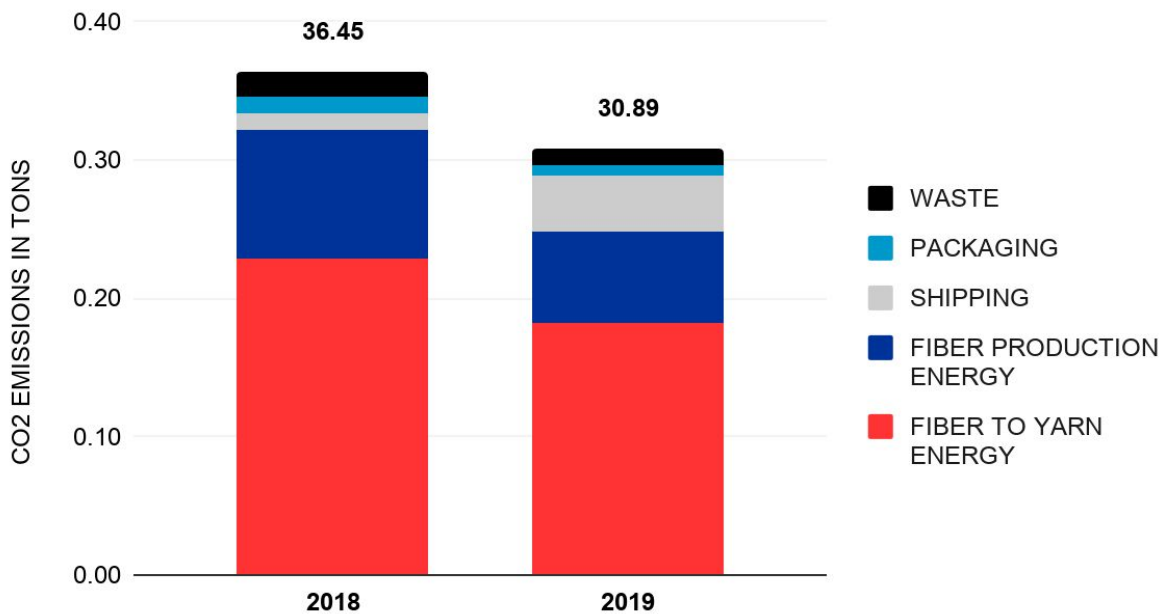
2.3.4 Apparel

Apparel is a main product victim to consumerism, but it is commonly overlooked when devising climate mitigation schemes. For this year's report we chose to share how we have addressed our impact through the creation of sustainable apparel items.

Starboard switched to organic cotton, due to the lower energy and water usage when transforming the cotton fiber to an apparel item. Figure 5 highlights the reduction in emissions from 2018 and 2019.

Furthermore, each apparel item is packaged in recycled paper bags, printed with soy ink, this ensures our packaging is biodegradable, and can be recycled effectively.

Figure 5: Bar chart displaying the decrease in Starboard's apparel emissions from 2018 to 2019.



2.4 Progress And Improvements On The Life Cycle Of Starboard Products

In order to reduce the impact of Starboard products, a Memorium Of Understanding (MOU) agreement has been signed between Starboard and Siam Chemical Group (SCG) to co-develop alternative virgin plastic materials. SCG, is Thailand's largest company, specializing in chemical development, and cement works. However, they also develop new materials made from recycled content and food waste. Starboard is working with SCG to develop materials made from bio-based materials such as food waste mixed with a lower rate of virgin plastic content.

Currently, Starboard's apparel range uses organic cotton to produce apparel items, but the search for the most sustainable material will continue, with sights on featuring hemp in the 2020 range.

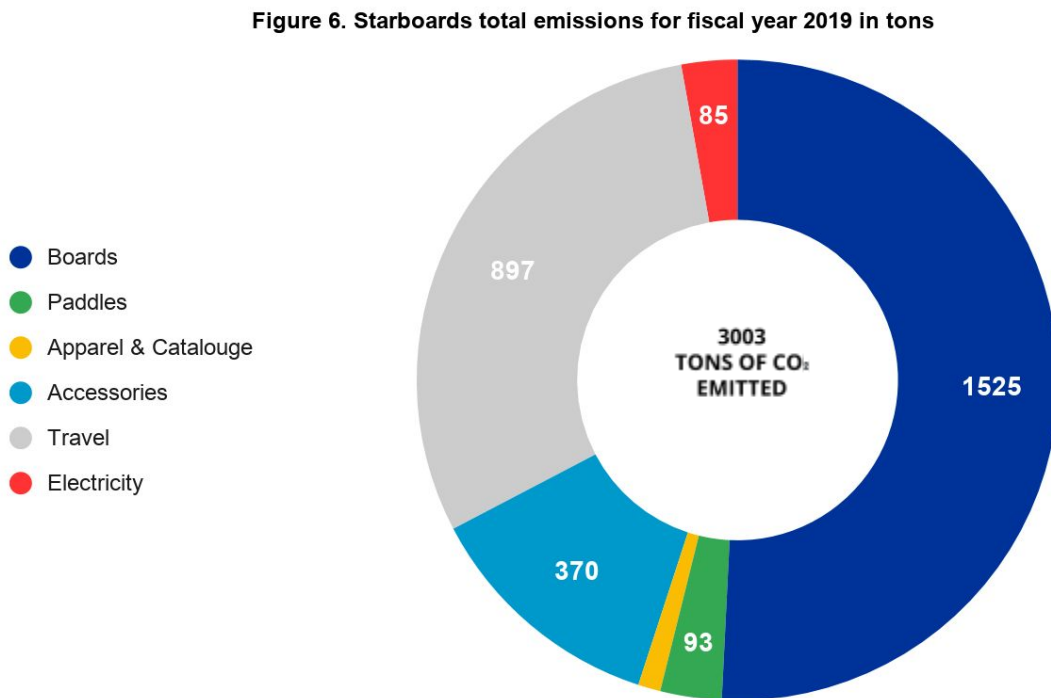
Although Starboard has progressed in terms of the CO₂ emissions produced by each product, the energy consumption of each product still requires improvement. Increasing renewable energy by installing solar panels on workshops is a step in the right direction, causing a 50% increase in clean energy.

Product manufacturing accounts for 50% of our total CO₂ emissions, so we hope to lead the way for our suppliers to convert to renewable energy.

3.0 Starboard's Total CO₂ Emissions And Carbon Sequestration

3.1 Total CO₂ Emissions Overview

Starboard's total carbon footprint can be categorized into boards, paddles, accessories, apparel & catalogue, electricity, and travel, this is shown in Figure 6 below.

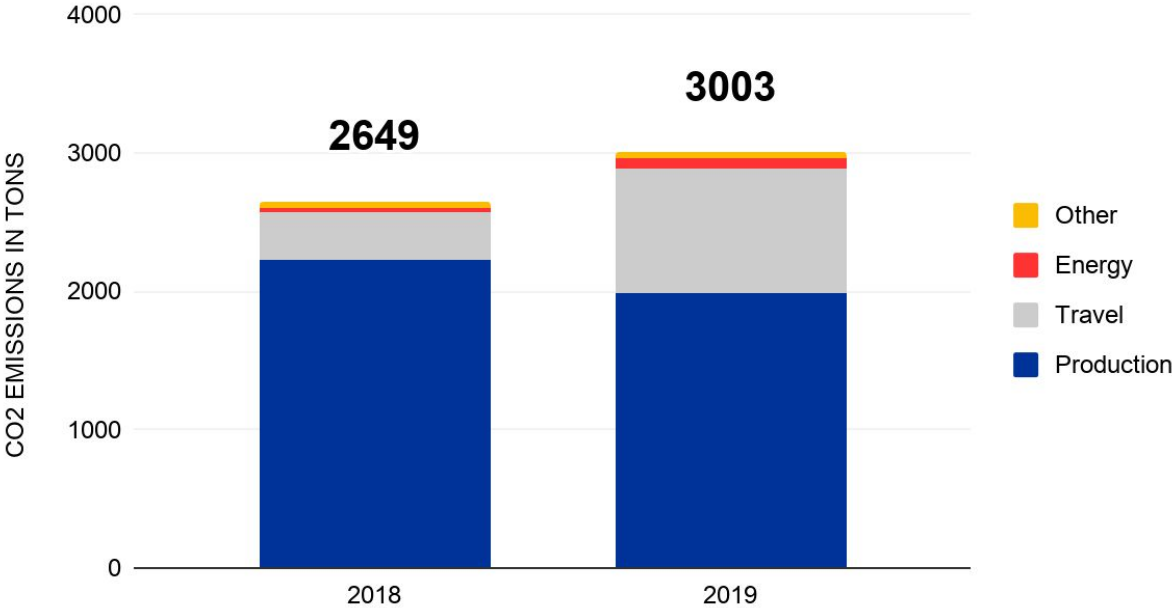


Using the LCA for all products and Starboard's general emissions, a comparison between 2018 and 2019 can be made (see Figure 7). Although, there has been a reduction in product emissions there is an overall increase in total emissions released by Starboard in comparison to last year.

The increase can be attributed to energy usage during production, and an increase in air travel. However, this could be a result of our Starboard Blue team receiving

more flight information from team riders. In order to account for all team riders, we gathered the received data and calculated an average, making it the first report to account for all of Starboard's team rider travel. As a final note, the calculation process is devised of various components, so human error could also play a role in decreasing the accuracy of our calculations.

Figure 7. Graph showing Starboard's total emissions for fiscal year 2019

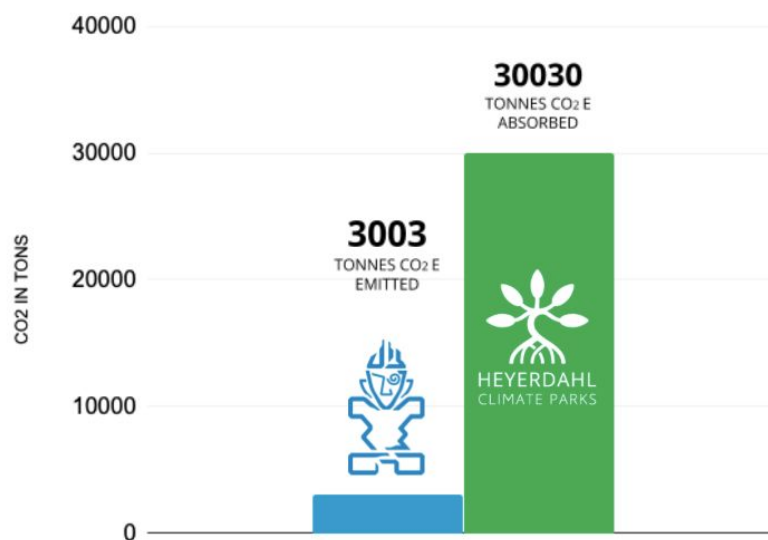


3.2 Carbon Sequestration

Starboard takes responsibility for the emissions produced by implementing a carbon offset (sequestration) program. In collaboration with Worldview International Foundation, Starboard plants mangroves at the Thor Heyerdahl Climate Park in Myanmar. The mangrove tree is able to sequester 1 ton of CO₂ over the first 20 years of its life.

In 2019, Starboard planted the number of trees needed to absorb the cradle to gate emissions of the company in 2018. Starboard went beyond this and planted an amount of trees to absorb these emissions 20 times over, with a total of 55,000 mangroves in the Thor Heyerdahl Climate Park for this reason. This will result in approximately 55,000 tons of CO₂ to be sequestered over the next 20 years. This year Starboard has planted the same total of trees that intends to absorb 10 times the amount of CO₂ released in 2019. Figure 8 below shows the comparison between the amount emitted and amount planted for. Therefore predicting that Starboard will sequester 30,030 tons of CO₂ through mangrove planting over the next 20 years.

Figure 8. Comparison of Starboard's CO₂ emitted versus the amount sequestered through tree planting in 2019



Starboard’s mantra is, “to plant one mangrove for each board produced”. On average, a board will emit 100 kg of CO₂ from cradle to gate. If we compare this with the 1000 kg that one tree sequesters, it shows that within the first 20 years of a tree's life that tree will be sequestering for more than just that board. This could therefore be seen as each board then being *10 times carbon positive* if you consider a mangrove is absorbing not only for the boards emissions but also for another 10 boards.

Furthermore, Starboard sponsors sporting events around the world in order to help them step up to help the environment, and influence those attending to be aware of the CO₂ emissions created from the event. Over the past few years, the number of trees planted is determined by calculating all emissions from those who are travelling to events. Details from the event organizers were also retrieved, such as energy consumption and safety boat usage. An example of this calculation is shown in Table 1.

| Partner / Event | Ton CO2 Emissions | Mangroves |
|-------------------------------------|--------------------------|------------------|
| ISA | 800 | 4000 |
| Santa Cruz Paddle Fest | 46.838 | 47 |
| Paris Nautic Paddle, 2018 | 86.662 | 87 |
| Distributors Meeting 2018 and 2019 | 1485 | 1485 |
| Tushingham Sails / Head of the Dart | 12.774 | 13 |
| ISPO | 31.8 | 320 |
| British SUP Championships | 19.34 | 20 |
| European Freestyle Pro Tour | 74.59 | 75 |
| The Nautic Show and Paddle, 2019 | 24,110 | 24,110 |

Table 1. Events showcasing the calculation of CO₂ emissions versus number of mangroves planted

4.0 Conclusion

Even though, in general Starboard's CO₂ emissions have increased from the previous fiscal year (2018), there has been significant improvement in sourcing green-technology, becoming carbon positive, and increasing accuracy in our carbon footprint reports. This report allows Starboard to be completely transparent about our impact on the planet and identifies areas requiring improvement.

Starboard recognises the years before our first-ever carbon footprint report needs to be accounted for, in terms of planting mangroves to account for absorbing the emissions created during this time. Therefore, focusing on the unaccounted years of 1994 - 2014 Starboard produced approximately 200,000 boards. If we include travel the average of this would be 75 kg CO₂ emitted per board. The result is 15,000 trees, to account for any areas of uncertainty 20,000 trees were planted to make the company carbon neutral for the whole of the business running from 1994. Not only does this make Starboard Carbon Neutral, but it also surpasses this as more trees were planted than needed to neutralise the company's emissions. This could mean that within the next 20 years Starboard will be carbon positive.

The total amount of trees planted by Starboard is 500,000. This exceeds the amount planted to account for all the runnings of the business and events supported through the carbon offset program. The true whole number of mangroves planted by the company over the last 26 years is 283,397. The resulting difference is due to Starboard planting more trees for extra engagement with Thor Heyerdahl Climate Park, meaning Starboard has planted to absorb an extra 216,603 tonnes of CO₂.

Starboard will continue to work to best possible practices to protect the beauty of nature and to reduce the company's impacts of climate change to the planet. The goal will be to continue to plant a tree per each board sold, to remove ten times the

amount of CO₂ released into our atmosphere during the cradle to gate life of a board. In the case of the iQFoil, Starboard will plant 10 mangroves per board with the aim to take 10 tonnes of CO₂ from our atmosphere and sink it back down into the ground.

Starboard's passion is not only for water sports, but for the whole planet.

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