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Development of Sustainability in Formula 1

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1 Introduction

1.1 Justification

“Formula 1’s got a long history of pushing the boundaries of technology” (Symonds, 2023). With the planet slowly warming, the pressure is on for companies to reduce their carbon footprint. Formula 1, with its extensive travel to 6 Continents per year, emits a large amount of CO2 into the atmosphere. With \$2.57 billion in revenue in the 2022 season, Formula 1 has the capability and funds to reduce this number drastically (Horton, 2023).

1.2 Aims

The aim of this report is to assess if Formula 1 is taking the necessary steps in order to reduce the total emissions the sport creates.

1.3 Objectives

The objective is to look at the different ways Formula 1 is reducing the sports carbon footprint. I will be looking at how they are reducing logistical emissions, the development of a sustainable drop-in fuel and how they are trying to reduce waste created by events.

2 Background

Step one of Formula 1's plan to becoming carbon neutral is to convert to a 100% sustainable drop in fuel. As shown by figure 1 only 0.7% of the total carbon footprint caused by Formula 1 in 2019 was fuel emitted by the 20 racecars however there is a much larger factor at play.

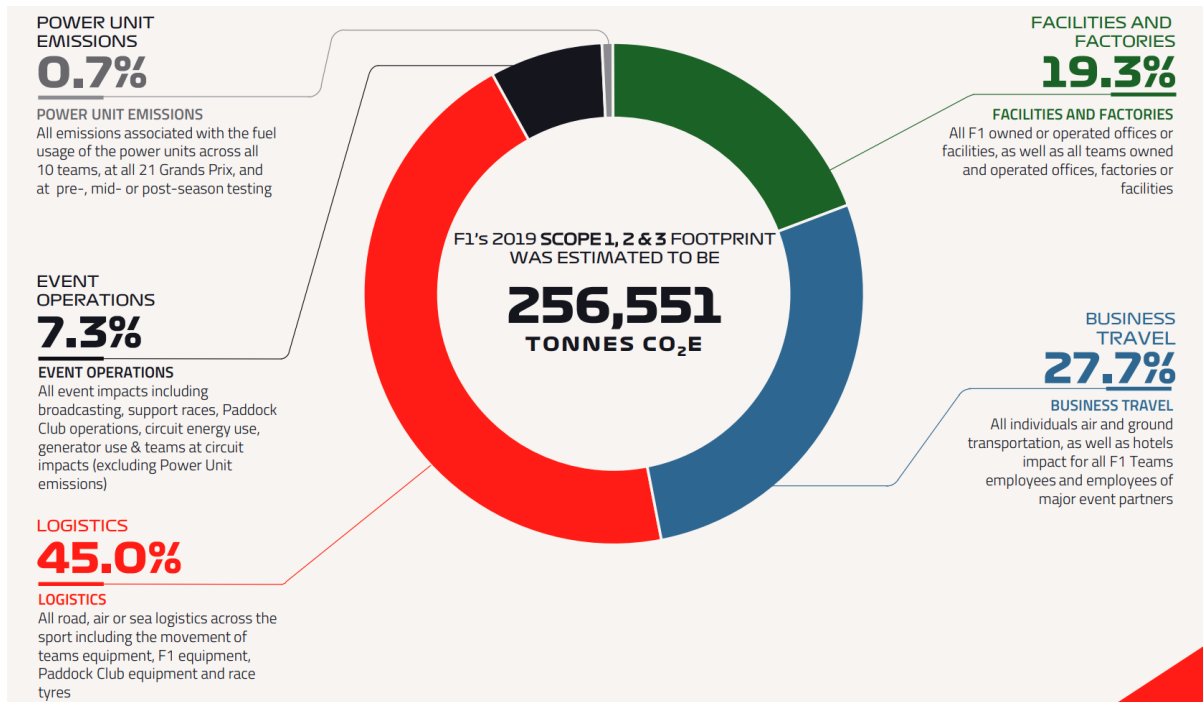


Figure 1- Shows a breakdown of Formula 1's carbon footprint in the 2019 season (Formula 1, 2019)

Conventional fuels originate from crude oil. Crude oil is a mixture of multiple different hydrocarbons. These hydrocarbons originate from the remains of organic matter that have been buried and have sustained high levels of heat and pressure for millions of years. Most of the crude oil is vaporized into gas as it is refined in a furnace. This gas is then transported into an 'Atmospheric Distillation Tower' where it is separated based on the boiling points (Canada Energy Regulator, 2018). When conventional fuels are burnt they release among other things; CO₂, CO, NO_x and HC. When burnt, it releases these gasses into the environment, where they haven't been present for millions of years.

(Hatton, 2022), Explains that sustainable fuels are made from carbon that has been recycled from biomass or carbon that has been removed from the atmosphere. Hatton then explains that the CO₂ that is emitted from the vehicle is equal to the amount that the plants had absorbed originally. Current F1 cars run on E10 fuel which consists of 10% biofuel and 90% fossil fuel. However, in 2026, all F1 engines will run on 100% biofuels. Formula 1's Chief Technical Officer Pat Symonds states that the current Hybrid Engines that are used in Formula 1 cars are "The most efficient engines on the planet. But I think the next revolution is just around the corner: 100% sustainable fuel that will work

just as well as existing fuels- it really is a drop-in fuel and it really will be our next breakthrough and something that will once again, using Formula 1, demonstrate the art of the possible” (Symonds, 2023). F1 cars are limited to 110kg of fuel per race, however, most drivers don’t start with the full amount to save weight and time per lap. Fuel takes up approximately 16% of the curb weight of the cars, 50% of this fuel, however, has been used by lap 20. Formula 1 teams on average would use 350,000l of fuel per season. (Partridge, 2023).

Another stage in the development towards being Carbon neutral is the progress that has been made to improve the logistics footprint, the process of transferring over to flexible shipping containers that can be used in both rail and sea freight (Barretto, 2022), and the transfer from Boeing 747 planes to the more efficient Boeing 777 planes. Formula 1 is also using 18 bio-fuel-powered trucks in Europe for the 2024 season. Head of Motorsports Logistics at DHL Paul Fowler expects a “minimum carbon saving of 60%” compared to the traditional trucks that are used for the European section of the calendar (Nagle, 2023).

3 Discussion

Formula 1 aims to be 100% carbon neutral by 2030 and the first step in their plans is a 100% sustainable 'drop-in' fuel. However, car emissions only covered 0.7% of the total carbon footprint in Formula 1 2019, as shown in figure 1 . Using figure 1 it is apparent that Logistics amount to 45% of the total carbon footprint in Formula 1's 2019 season, which is nearly 65 times more than the emissions emitted by all 20 cars across all races, practices and qualifying. A further 27.7% (Formula 1, 2019) of F1's carbon footprint goes towards business travel. In total 186,512 metric tons of CO₂ is produced from Logistics and Business Travel alone (Nagle, 2023).

Table 3-1: (Nagle, 2023) Shows the total distance travelled for the '19, '23, and '24 seasons whilst showing an optimized calendar for the '23 season to show how Formula 1 can cut back on emissions

Formula One calendars				
Leg	2019	2023	Optimised 2023	2024
1	Melbourne 8960.73 nmi	Bahrain 2934.17 nmi	Melbourne 8960.73 nmi	Bahrain 2934.17 nmi
2	Bahrain 6543.04 nmi	Jeddah 687.18 nmi	Singapore 3269.93 nmi	Jeddah 687.18 nmi
3	Shanghai 3678.75 nmi	Melbourne 6911.83 nmi	Nagoya 2745.98 nmi	Melbourne 6911.83 nmi
4	Baku 3435.20 nmi	Baku 7012.87 nmi	Jeddah 5029.41 nmi	Nagoya 4404.16 nmi
5	Barcelona 2137.05 nmi	Miami 5954.97 nmi	Bahrain 687.18 nmi	Shanghai 811.88 nmi
6	Monaco 271.40 nmi	Bologna 4400.56 nmi	Doha 76.67 nmi	Miami 7167.27 nmi
7	Montreal 3306.34 nmi	Monaco 175.35 nmi	Abu Dhabi 161.36 nmi	Bologna 4400.56 nmi
8	Marseille 3244.90 nmi	Barcelona 271.40 nmi	Baku 980.70 nmi	Monaco 175.35 nmi
9	Spielberg 461.91 nmi	Montreal 3184.36 nmi	London 2143.80 nmi	Montreal 3306.34 nmi
10	London 636.52 nmi	Spielberg 3452.81 nmi	Amsterdam 192.92 nmi	Barcelona 3184.36 nmi
11	Manheim 255.67 nmi	London 636.52 nmi	Liege 106.90 nmi	Spielberg 644.16 nmi
12	Budapest 527.96 nmi	Budapest 782.40 nmi	Budapest 561.48 nmi	London 636.52 nmi
13	Liege 561.48 nmi	Liege 561.48 nmi	Spielberg 417.93 nmi	Budapest 782.40 nmi
14	Milan 343.12 nmi	Amsterdam 106.90 nmi	Bologna 217.56 nmi	Liege 561.48 nmi
15	Singapore 5544.55 nmi	Milan 447.96 nmi	Milan 106.58 nmi	Amsterdam 106.90 nmi
16	Sochi 4241.35 nmi	Singapore 5544.55 nmi	Monaco 128.53 nmi	Milan 447.96 nmi
17	Nagoya 4272.87 nmi	Nagoya 2745.98 nmi	Barca 271.40 nmi	Baku 1793.68 nmi
18	Mexico City 6233.99 nmi	Doha 4336.18 nmi	Montreal 3184.36 nmi	Singapore 3750.99 nmi
19	Austin 654.73 nmi	Austin 7032.81 nmi	Miami 1227.25 nmi	Austin 8545.46 nmi
20	São Paulo 4370.78 nmi	Mexico City 654.73 nmi	Mexico City 1115.28 nmi	Mexico City 654.73 nmi
21	Abu Dhabi 6541.23 nmi	São Paulo 4012.73 nmi	Austin 654.73 nmi	São Paulo 4012.73 nmi
22	Back to HQ 3150.92 nmi	Las Vegas 5281.80 nmi	Las Vegas 941.11 nmi	Las Vegas 5281.80 nmi
23		Abu Dhabi 7116.99 nmi	São Paulo 5281.80 nmi	Lusail 7035.77 nmi 7041.13 nmi
24		Back to HQ 3150.92 nmi	Back to HQ 5034.04 nmi	Abu Dhabi 161.36 nmi 162.94 nmi
25				Back to HQ 3150.92 nmi
Total	69,374.49 nmi	77,397.45 nmi	43,499.63 nmi	71,551.54 nmi

In the 2019 season, when Formula 1 released its sustainability strategy, 69,374 nautical miles were racked up traveling to and from the 21 races. However, 77,397 nautical miles will be traveled over the course of the 2023 season (Nagle, 2023). Although it's currently impossible to reduce all CO₂ emissions emitted by this travel completely there are many ways to drastically reduce it. The most effective way would be to restructure the season's calendar to form a route that stops at all the different locations whilst on one 'sweep' across the globe. Nagle, created a new optimized calendar theory by separating the races into different sectors based on geographical locations and worked out the shortest routes amongst the groups and then to the next group, see Table 3-1. By doing this

Nagle managed to reduce the total nautical mileage down to 43,500. Which, even with 2 extra races, is a reduction of 37.3% from the 2019 season (Nagle, 2023).

Formula 1 has also cut back on their broadcasting teams emissions as they have transferred to remote broadcasting, this means that Formula 1 can permanently base a large part of the team in Kent. This means that a third of all personnel and equipment are no longer needed at every event (Davies, 2023).

Formula 1's tyre sponsor Pirelli has also made the decision to become more eco-friendly and is targeting a 100% switch to renewable energy by 2025. The tyres are being developed with rubber that does not promote deforestation. Tyre testing is being pushed more towards simulations to save resources. At the end of their lives, the tyres will get broken down to be recycled into flooring for athletic tracks and playgrounds (Davies, 2023). Because of their development in sustainability, Pirelli has been awarded the Three Star Environmental Accreditation award, issued by the FIA.

The drop-in fuel that is being developed for Formula 1 is also going to be advertised for use in road cars. It's estimated that only 1 in 250 cars, 0.4%, are electric (Kilgore, 2023). And this number is only expected to rise to 8% by 2030 (Richards, 2021), this means that 92% of all cars on the road in 2030 will be internal combustion powered. This means that the market for sustainable fuels is endless. Formula 1 urges its viewer to make informed decisions about reducing their carbon footprint by using this drop in fuel or using a bike/ public transport to get to events.

Dropping the internal combustion engines in favour of electric engines may seem like the answer to reducing the carbon footprint created by the sport, Formula 1's CEO Stefano Domenicali explains that Formula will never transition over to the use of electric powertrains. The main reason behind this would be that there would have to be many changes to the event structure due to there not being any available batteries to support the entire length of a race, this is why in Formula E the races range between 45 and 50km total race distance and in Formula 1 this distance is closer to 300km. In order to make batteries lots of different elements are used that need to be mined, the mining of these elements creates a large amount of CO₂ as well as destroys the local environment. Batteries are also very heavy so not only will they drastically slow down the race cars they will also create a large amount of CO₂ during transportation after production and in between race events.

4 Conclusion

This report demonstrates that Formula 1 has many areas/sectors to tackle in order to significantly lower its carbon footprint to zero by 2030. Although they are making great technological advancements, whilst all the time striving to not negatively impact upon the popularity of the sport, it is clear that the industry as a whole will need the total support and buy in from all of their partner organizations ranging from tyre manufacturers through to event and hospitality contractors to achieve their goal by 2030.

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