



Polycentric governance and Institutional pressures: Shaping sustainability in Formula 1 racing

by

Marion Titone

under supervision of

Joseph Earsom

Dissertation submitted in partial fulfillment of
the requirements for the degree of

[B.A. in Political Science (or) B.A. in International Relations]

02/05/2024

Word count:

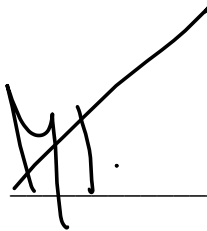
(8816)

Author declaration

I hereby declare that this dissertation is my own work and effort and that it has not been submitted anywhere for any award. Where other sources of information have been used, they have been properly acknowledged.

I also certify that the content of the print and digital versions of this dissertation are strictly identical in terms of content.

I understand that any plagiarized or improperly cited material will result in sanctions, including, but not limited to, the rejection of this dissertation, as will any discrepancy of content between its print and digital versions. I confirm that my dissertation does not contain material for which the copyright belongs to a third party or that for all third-party copyright material in my dissertation, I have obtained written permission to use the material and attach copies of each permission.



[Marion Titone.]

Dissemination agreement

Availability within the School

I understand that the European School of Political and Social Sciences (ESPOL), based at Lille Catholic University, France, will keep print and digital copies of this dissertation.

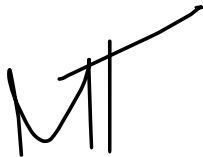
- By ticking the optional checkbox next to this paragraph, I agree that the print and digital copy of this dissertation be made available for consultation by the School's students and/or staff.

Availability of print copy outside of the School

- By ticking the optional checkbox next to this paragraph, I agree that the print copy of this dissertation may be made available through Lille Catholic University's Library, to anyone allowed to access the Library.

Availability of digital copy outside of the School

- By ticking the optional checkbox next to this paragraph, I agree that the digital copy of this dissertation may be made available through Lille Catholic University's Library online repository.



Marion Titone

Abstract

This study looks at the intricate dynamics of sustainability governance in Formula 1 (F1) racing. Based on Ostrom's theories of polycentric governance, institutional theory, diffusion theory, and social influence, the study examines the roles, resources, and impacts of the major players on F1's sustainability agenda. The results demonstrate how important it is for the governing body (FIA) and F1 management to shape the sport's environmental priorities through communication, policy, and regulations. The significance of sponsors and supporters in propelling and moulding sustainable projects is also emphasized in the study. In addition, the study looks at how sustainable technologies and best practices from Formula One are transferred to the automotive sector as a whole, helping to build a circular economy and sustainable mobility solutions. In light of these findings, the paper's conclusion discusses how Formula 1 and other sports organizations dealing with challenging environmental issues should comprehend the complex and multidimensional nature of sustainable governance.

Keywords: sport governance, polycentric governance, sustainability governance, institutional pressure, Formula 1

Résumé

Cette étude examine la dynamique complexe de la gouvernance de la durabilité dans les courses de Formule 1 (F1). Basée sur les théories d'Ostrom de la gouvernance polycentrique, de la théorie institutionnelle, de la théorie de la diffusion et de l'influence sociale, l'étude examine les rôles, les ressources et les impacts des principaux acteurs de l'agenda de la F1 en matière de durabilité. Les résultats démontrent l'importance pour l'organe directeur (FIA) et la direction de la F1 de façonner les priorités environnementales du sport par le biais de la communication, de la politique et de la réglementation. L'étude souligne également l'importance des sponsors et des supporters dans la promotion et la mise en place de projets durables. En outre, l'étude examine comment les technologies durables et les meilleures pratiques de la Formule 1 sont transférées au secteur automobile dans son ensemble, contribuant ainsi à la mise en place d'une économie circulaire et de solutions de mobilité durables. À la lumière de ces résultats, la conclusion du document explique comment la Formule 1 et d'autres organisations sportives confrontées à des problèmes environnementaux difficiles devraient comprendre la nature complexe et multidimensionnelle de la gouvernance durable.

Mots-clés : gouvernance du sport, gouvernance polycentrique, gouvernance de la durabilité, pression institutionnelle, Formule 1

Acknowledgements

First, I would like to thank my research supervisor, Joseph Earsom, who helped me shape my work, and guided me through the difficulties that I encountered. I am truly grateful for your understanding and insightful advice.

I would also like to thank my friends and family who supported through my work, and always kept me motivated when I needed it the most. I would like to give a special thank you to my father who showed me my first Formula One races when I was only a child and made me believe that it could be more than just a passion.

Lastly, thank you to ESPOL, all the great teachers and people that I met during my degree, thank you for making these years unforgettable, and for always being attentive to others,

Contents

Table of Contents

.....	0
Author declaration.....	1
Dissemination agreement	2
Availability within the School	2
Availability of print copy outside of the School.....	2
Availability of digital copy outside of the School	2
Abstract.....	3
Résumé	3
Acknowledgements.....	4
Contents	5
Introduction.....	6
Background explanation.....	6
Literature review:	8
Theoretical framework.....	9
Methodology	9
1. Role of Different Decision Centers (FIA, F1 Management, Teams, Sponsors, Fans)	10
2. Influence of Key Institutions (FIA, F1 Management) on Sustainability Priorities.....	12
3. Impact of Public Opinion and Fans on F1's Environmental Agenda.....	18
4. Diffusion of Sustainable Innovations and Best Practices	20
Possible recommendation.....	21
Discussion and Conclusion	22
References	24

Introduction

“Speed is the oxygen of my life”, like Ayrton Senna, people have always wanted to go faster. You must go back to 1894 to find the very first motor race: Paris-Rouen. Back then, cars were called “oil or steam engines”, nothing to do with the glamour and luxury of today's racing cars, which now easily reach 300km/h.

In the early 19th century, car manufacturers wanted to prove the reliability and performance of their cars. As a result, motor racing has continued to develop and change over the years. At the end of the 19th century, there were only a few local races, but motor sport quickly developed on an international scale. Certain races, such as the 24 Hours of Le Mans and the Belgian Grand Prix, became legendary. The years were marked by the medialization of motor sport and its growing popularity thanks to the emergence of radio and television in the home. More than a century after its beginnings, motor racing is facing major challenges. In recent years, the sport has been criticized for its extremely damaging impact on the environment. Will the sport be profoundly transformed in the years to come? Is the sport in danger of disappearing because of environmental problems?

The objectives of this study will firstly be to map the key players involved in sustainability governance in Formula 1, examining their resources, expertise and impact. The study will also focus on processes of influence.

Next, we'll look at the objectives, strategies and action plans taken by the FIA and F1 management to achieve their sustainability goals. Next, we will examine how public opinion and fans influence F1's environmental agenda. This involves analysing fans' perceptions and expectations of F1's sustainability initiatives, as well as the impact of public opinion on F1's strategic choices.

Finally, we'll make a comparison with sustainability management in other motorsports. Finally, we will examine how sustainable innovations and best practices are disseminated. The aim is to identify sustainable technological and organizational advances in F1 and implement them in motorcycles. The transfer of knowledge and expertise between F1 research and development and the automotive industry as a whole will also be studied. Finally, we will examine the potential large-scale effect of Formula 1's sustainability initiatives on the creation of sustainable mobility solutions and a circular economy.

Background explanation

The first car races took place in Europe, mainly in France and Italy, where local carmakers organized events to test their latest cars. Over time, motor racing became increasingly competitive and professional. In the 1950s, Formula 1 became the most important motor sport, with drivers such as Juan Manuel Fangio and Stirling Moss. At the time, the championship consisted of just seven Grands Prix:

Great Britain: Silverstone circuit - Monaco: Monaco city circuit - Indianapolis: Indianapolis Motor speedway - Switzerland: Bremgarten circuit - Belgium: Spa-Francorchamps circuit - France: Reims-Gueux circuit - Italy: Monza circuit.

The 1990s marked a turning point in motor sport, marked by technological advances and the emergence of touring car and endurance racing. This decade in Formula 1 was characterized by one of the most popular rivalries: the Ayrton Senna / Alain Prost duel. The decade was also characterized by tragedy, most notably the death of Senna in 1994, the traces of which are still visible in motor sport today.

The evolution of the automotive industry is marked by passion, talent, technology and innovation. Some of the world's greatest drivers and automakers have taken part in this competition. Motorsport has gone through periods of glory and mourning. Today, the automotive industry continues to progress and develop, offering enthusiasts new experiences and emotions at every circuit.

Practical guide to F1:

Today, and for several years now, there are 10 different teams in F1, all of which have two cars, and therefore 2 drivers. A Formula 1 season is made up of race weekends, spread over three days: two 'practice' days and one race day. F1 travels the world to bring a spectacle of speed and technology to as many fans as possible. Like other motor sports, F1 is part of a federation, the Fédération Internationale de l'Automobile (FIA). It brings together 243 international organizations in 146 countries. The FIA is a non-profit organization, founded in 1904, with headquarters in Paris. The Fédération Internationale de l'Automobile operates on a global scale through its 243 subsidiaries, to ensure that it is as close as possible to reality and the real world.

The common mission of the FIA and its representatives around the world is to regulate, organize and promote motor sport. The role of the national representatives of the FIA (Fédération Française du Sport Automobile) is, as mentioned in their name, to supervise national competitions in the various motorsport disciplines. For example, these national organizations are responsible for issuing the licenses required to take part in competitions. Only the Super Licence, which is compulsory for participation in the Formula 1 World Championship, is issued directly by the F. In addition, these bodies are responsible for both the homologation of racing vehicles and the training of the various licensees who supervise the events.

Motor sport emerged at a time when ecology and the environment were not yet concerns. Sustainability was far from being a priority, we didn't even talk about it. Since 1990, the international community has begun to become aware of the influence of human activity on the environment, and the motor industry has been criticized for its use of fossil fuels and its ecological footprint.

It's been around thirty years since the motorsport industry gradually began to factor environmental sustainability into its concerns. The Environment and Sustainable Development Commission was set up by the Fédération Internationale de l'Automobile and held its first meeting in March of 2017. Its mission is to promote and simplify sustainability in all motor sports. It includes members of the FIA, members of its national federations and numerous automotive industry partners, who include vehicle manufacturers, equipment suppliers and energy providers. The FIA ensures that all these players improve their impact on the environment.

Since the emergence of sustainability in motor racing, many changes have been observed. These include changes to vehicles, engines, and organizational systems. Increasingly,

teams, drivers and fans are aware of the importance of taking steps to reduce motorsport's ecological footprint.

Literature review:

When we look at the subject of sustainable development in sport, we can find a large number of works explaining either the impacts that global warming may have had on sports, as with Paccard (2009) in his article on global warming and snow resources in ski areas, which shows that ski resorts are strongly impacted by climate change, with a decline in natural snow cover jeopardizing their activity. According to the research, by 2050, only a handful of resorts will be able to continue operating. Then, if we take a closer look at the impact of sport on the environment and ask whether it could be one of the causes of global warming, we find a large part of studies which, as a whole, prefer to say that sport can be the bearer of good intentions. For example, if we read the work of Kirouane and Gherzouli (2020), we'll learn from their study that sport can be used as a means of fostering the sustainable development of a working-class district, by improving social, environmental, and economic aspects in an integrated way.

However, if we try to look more closely at the literature on motor sports, this is where we run into our first problem. There is in fact very little literature dealing with the links that might exist between sustainable development and motor sports, apart from literature mainly concerning Formula E and its championship. Formula E is the electric equivalent of Formula 1. Created in the 2010s, this category of electric single seaters was designed to “respond” to the criticism the FIA had levelled at F1. The FIA created this championship to prove that motor sports could be environmentally friendly. Books covering this subject include 'Innovation, Sustainability and Management in Motorsports: The Case of Formula E' by Næss, H.E. and Tjønnndal, A. (2021).

Being familiar with motorsports, I was already aware that Formula 1 is now, and has been for some years, engaged in programs and projects aimed at reducing its carbon footprint and becoming a more environmentally friendly sport, while still managing to retain the motorsports tradition. So, I wanted to take an interest in this paradigm, a problem that seems improbable, even implausible. Because it's true that, at first glance, Formula 1 doesn't meet any criteria in terms of respect for the environment. It's a sport that involves powerful cars that consume a certain amount of petrol, which we all know pollutes our planet enormously through its carbon emissions. What's more, it's a sport that travels all over the world, and a lot of it in a very illogical and irresponsible way, when you look at the Grand Prix calendar and realize that it goes back and forth between continents every month. But despite all this, I wanted, through this research project, to understand the action plans put in place by F1 and the FIA, and then to understand how these programs were put in place, and who the main players in this change are.

Theoretical framework

To carry out this political science research file project, I first decided to base myself on Ocrpom's Polycentric Governance Theory (2010). Polycentric Governance Theory provides an interesting theoretical framework for studying sustainability governance in Formula 1. According to this theory, to solve complex problems such as environmental issues, it is essential to adopt an approach that involves many interdependent decision-making centers, rather than focusing on centralized governance. In this way, this theory will enable us to understand why and how there can be many different decision-makers regarding F1 environmental governance.

Secondly, I would also use Institutional Theory according to Amenta and Ramsey (2010), which allows us to examine the impact of institutions, as systems of rules, norms and values, on the behaviour of organizations and individuals within a specific organizational domain. Thus, applied to our situation, this theory allows us to grasp how Formula 1's main authorities, the FIA, F1 management and teams, influence motor sport's sustainability priorities.

I will then base my research on Herbert Kelman's Social Influence Theory (1974), which is highly relevant to understanding the role of Formula 1 fans in the governance of the sport's sustainability. More specifically, to understand how fan engagement contributes to Formula 1's ecological transition.

And finally, I will draw a parallel between the Diffusion Theory, developed by Everett Rogers, which describes the process by which an innovation spreads and is adopted within a population, and the sustainable innovations introduced by Formula 1 that have spread throughout the automotive industry and society.

Methodology

In terms of method, I decided to use the mixed method for this research project, which is both qualitative in that I collected numerous reports and legal documents from the FIA, F1 and its partners, which I was able to analyse assiduously to understand the methods of governance around the sport. But I also used the quantitative method because I was able to analyse surveys which gave me an in-depth understanding of the subject, and I was able to use my personal knowledge as a fan of the sport by looking at the communication made around F1 and its environmental projects. To integrate this mixed method into my research file, I began by collecting the data that seemed relevant to the subject, and then analysed them to draw my conclusions.

1. Role of Different Decision Centers (FIA, F1 Management, Teams, Sponsors, Fans)

a) The Fédération Internationale de l'Automobile (FIA) :

When talking about motorsports in general, there is one name that will constantly come back in the discussion: the FIA (Fédération Internationale de l'Automobile). As presented previously, it is the regulatory governing body of F1, and has a significant influence on the rules and regulations of the sport. It possesses important resources, especially its legal framework and the financial resources it obtains from the membership fees that can go up to 11,000€; and the many partnerships they benefit from: Michellin, Pirelli (*Nos partenaires*, 2018). Their expertise over technical knowledge, safety standards, event management and governance in general, combined with their compelling influence over the sporting and technical rules of F1, renders the FIA as the main political elite in F1's sustainability governance (Nichols and Savage, 2017).

b) F1 Management: Liberty Media

As we now understand the relationship between the FIA and F1's governance, let's look more closely at the role of F1 management, which we consider in this study as the F1 Group managed by Liberty Media. Because the FIA is the "rule maker", F1 management's main activities are more business oriented. Indeed, Liberty Media owns all commercial rights to F1 from broadcasting to sponsorship deals and merchandise sales, providing them with a consequential revenue (*Liberty Media Corporation Agrees to Acquire Formula One*, sans date). Also considering their expertise in business management, marketing, event organization, media relations and negotiation (*Executive Insights*, 2024), and how we have witnessed the influence it has had on the financial landscape of sport (Fisher, 2024); we can confidently affirm that Liberty Media is a business and financial elite as much as it is a social elite.

c) Formula One Teams:

Now looking more specifically at the different teams that make F1 the competitive sport it is, there is quite a lot of different aspects to consider. We will start with the most obvious one: the drivers. As all athletes have, they had to work hard all their life, or most of it, to earn their current positions, and still must fight to keep it, especially in F1 as there is only 20 drivers in the world who can race in this category. But through their skills, natural born or performed talent and their outstanding performances, they have deserved their so coveted seats; we can thus consider that they are part of the meritocratic elite in the governance of F1 (Nichols and Savage, 2017). As we introduced the functioning of F1 teams in the introduction, we acknowledged that the second most important role is the team principal. They often are retired pilots or technical and engineering experts which enables them to have a global understanding of not only the team's needs, but also the sport's. They are very implicated in the sustainability of their team as they have some influence over the team's budgets dedicated to research and development, and sponsorship deals. These characteristics renders the

team principals but also the team, as part of the technical elites in F1's sustainability governance (Nichols and Savage, 2017).

d) Formula One sponsors and team sponsors

As mentioned, when talking about the previous different decision centres in F1, the sponsors have an important role in the sport with 275 of them for the 2023 season (Venturoli, 2023). Their financial investment in the teams and consumer engagement gives them a certain power and influence over the team's marketing strategies, which has thus an impact on the public perception of the team and the sport in general. So, to have the best results from a sponsorship in terms of customer reactions, the relationship between the entity and the sponsor is essential (Plewa, C. and Quester, P.G., 2011). Hence the importance for the teams to have sponsors that reflect their sustainability goals and are in accordance with their CSR policies. For example Aramco, an oil company and the main partner with Aston Martin on their team, is investing on the development of efficient combustion engines and high-performance sustainable fuels for their cars. Their many projects aim to improve the engine performance and reduce emissions to help lower the carbon footprint of F1 (*The Aramco And Aston Martin Racing Strategic Partnership*, s. d.). So, considering the important investment and collaborations with the teams and the sport, we can consider that the sponsors are part of the main actors involved in the sustainability governance of F1 teams.

e) Formula One fans

Finally, it may not always be obvious but the last main actors that plays an important role in F1 sustainability governance is the fans.

Indeed, if we think about it in a more general way, and not only consider Formula 1 but sport championships as a whole; we can easily conclude that they don't exist if there isn't any fans. Of course, one could argue that athletes take part in their respective sports because they are passionate about it and want to fulfil their sense of self-achievement. But don't we always hear that the passion of sports, first comes from the passion of sharing emotions, those feeling that make you vibrate, that make you widen your eyes, and also sometime cry in front when you lose a final, that make you scream from an overload of joy in a sport-bar filled with strangers that all share the same passion.

We witnessed what an empty racetrack and stands looked like when covid hit in 2020 and F1 managed to organize a couple Grand Prix but with no fans; Lewis Hamilton, 7 times World Champion -driver for Mercedes, said in a video addressed to his fans on Twitter : 'we're going to miss you at the races, I'm going to miss seeing you guys at the races. (...) Driving past empty stands is going to be not too inspiring, it's going to be quite lonely'. (F1, 2020).

After understanding that the presence, or lack of, affects the drivers, we can safely assume that fans play an important role in the governance of Formula One.

2. Influence of Key Institutions (FIA, F1 Management) on Sustainability Priorities

As previously observed, the Fédération Internationale de l'Automobile (FIA) and Formula 1 management have considerable influence over the sport. The goals, plans, policies, and communications of the governing body, which also holds the commercial rights, influence the decisions and behaviors of teams, sponsors, and supporters. This section looks at how these influential organizations use their leverage to help Formula 1 achieve its sustainability targets.

a) The FIA

The FIA entered a transitional phase succeeding the COP 21 and the Paris Agreement in 2016, and started putting in place programs at different levels, in particular by signing the "Sport for Climate Action" framework in December of 2019.

It is a climate action movement that brings together sports organizations and their members wishing to implement concrete projects and actions, with the aim of transitioning to a low-carbon economy as envisaged by the Paris Agreements. The two main objectives are to fight global warming to meet the 2-degree scenario set out in the Paris Agreements, in particular by reducing greenhouse gas emissions; and secondly, to use sport as a means of bringing people together and strengthening their solidarity in support of climate action. Members of the Sports for Climate Action Initiative have committed themselves to five principles and to incorporating them into strategies, policies and procedures, with the aim of spreading the message more widely and ensuring its long-term success. These five principles are respectively: (United Nations Climate Change, 2018)

1. Undertake systematic efforts to promote greater environmental responsibility.
2. Reduce overall climate impact.
3. Educate for climate action.
4. Promote sustainable and responsible consumption.
5. Advocate for climate action through communication.

The signing of this agreement makes it clear that the FIA is committed to fulfilling its commitments, which we will present in greater detail later on. By joining forces with an organization such as the United Nations, the FIA moves from being a "governing institution" to being a partner and is thus 'accountable'. This makes it easier for a study to report on its progress.

In this way, the FIA has concretely set objectives for its various organizations. In this research file, we will concentrate solely on the objectives relating to Formula 1.

i) Carbon reduction plan

To comply with the 2016 Paris Accords, from which the 'Sport for Climate' action is derived, the FIA presented to the public and its partners in 2019 its program and strategy to achieve carbon neutrality from 2030: Net Zero Plan.

This plan aims to reduce emissions from its activities by 20% by 2025 and 50% by 2030, in order to become net zero carbon in the following years by eliminating residual emissions. In

addition, with the aim of achieving carbon neutrality by 2030, this year's environmental impact has been fully offset through investments in regulatory projects. The projects selected comply with the strictest international standards and are spread across three continents (South America, Africa and Asia). These initiatives include forest protection and restoration programs, as well as renewable energy production projects. They help to protect biodiversity, support local communities and promote economic growth in developing countries.

In order to assure its partners and the public that the FIA is serious about its ambitions, despite their apparent size, it has obtained 14001/2015 certification, which outlines the conditions for putting in place a successful environmental management system and is unquestionably beneficial for enhancing its ecological performance (Todt and Calderon, 2020).

In its environmental strategy, the FIA specifies among its objectives that all the world motor sport championships it oversees must implement their own action plans by 2025, and that they too must achieve carbon neutrality by 2030. In this situation, the FIA therefore plays a governance role in motor sports, with the aim of reducing the negative impact of motor sports on the environment and strengthening motor sports as a driver of sustainable innovation and technology.

ii) Environmental accreditation program

Among the FIA's ambitious projects, we'll begin this analysis with the environmental accreditation program, which in the case of motor sports, but in this case F1, concerns the circuits, the F1 Grand Prix in terms of organization and events, the teams and also the manufacture and distribution of tires on Grand Prix weekends; with the aim of being able to assess and improve their environmental performance. Thanks to a three-level assessment system, it enables certification of the activities of stakeholders: for each level reached, a star is awarded.

The initial recognition level, symbolized by a single star, is the lowest level of accreditation. Stakeholders who have been awarded this certification are considered to have a basic level of performance in terms of environmental impact and are strongly encouraged to improve. The second star, synonymous with good practice, is awarded to players who demonstrate satisfactory environmental performance and who are in the process of following internationally established environmental management roadmaps. Players who manage to achieve three stars are rewarded for their commitment to tackling climate change and reducing their carbon footprint. This certification enables those who obtain it to take care of their brand image. It has been obtained by Aston Martin, Ferrari, DS Penske, Audi Sport, Circuit Paul Ricard, Monza, the French Formula 1 Grand Prix, Pirelli and Bridgestone Motorsport, among others.

To apply for accreditation, players must be prepared to undergo a lengthy evaluation process by the FIA, the aim being not to discourage but rather to ensure the quality of the actions implemented. The aim is not to discourage, but rather to ensure the quality of the actions undertaken, so that these environmental accreditations retain their legitimacy and can provide external individuals, such as fans, with a credible benchmark of quality. What's more, the application and renewal fees enable the FIA to ensure that players are initially motivated to obtain these stars.

In 2023, Formula 1 was able to demonstrate its commitment to a move towards functional environmental governance by becoming the first FIA championship in which all participating teams were awarded the three-star environmental accreditation (User Enovation Consulting, 2024).

There is no precise information, at least not publicly available, giving further details on the financial benefits that a player might receive when awarded the FIA's three-star environmental accreditation. We can only deduce that this benefit would be a reduction in costs over the long term; but the FIA emphasizes that players must first and foremost want these three stars to ensure and consolidate their reputation. We can therefore deduce that the FIA wants these accreditations to serve above all as benchmarks for outside players, but also to inject a sense of competition into the comparison between entities. What's more, the FIA makes it clear that the goal of achieving the highest accreditation should not be an end in itself, but rather a vehicle for greater commitment and, above all, a long-term focus.

iii. A 100% sustainable fuel

Secondly, but still with the aim of achieving carbon neutrality, the FIA has launched a project to create a 100% sustainable fuel to replace the current fuel used in Formula 1 single-seaters. Today, and since 2022, teams have been using a fuel called "E10", made from 10% renewable ethanol, and the FIA's aim is to move to 100% by 2026 (F1, 2024). It is also important to note that the term "carbon neutral" used to characterize this future fuel meaning 'the same amount of carbon used to produce that fuel will be the same quantity as the carbon emitted from the engine' (FIA, 2024). The FIA also insists that the fuel will be "drop-in", meaning that it will be suitable for all types of engines and therefore all types of car, even outside motor racing. This shows that, although the FIA is concentrating on F1 for 2026, the long-term aim is to bring 100% sustainable fuel to the global automotive market: F1 is therefore finally being used here, thanks to the FIA and its global influence, as a springboard for the research and development of sustainable, environmentally friendly technologies.

The research and development of this component was entrusted to Aramco, the oil company which sponsors both the Aston Martin team and the Formula 1 group. Since 2023, it has been able to produce and supply the Formula 2 and Formula 3 championships (the Formula 1 sub-categories for young drivers) with fuel made from 55% renewable ethanol (Formula 2 and Formula 3 partner with Aramco to pioneer low-carbon fuels from 2023, 2022).

iv. FSC certified tyres

To ensure that it meets its environmental responsibility commitments of "net zero" by 2030, the FIA must ensure that all its employees are also involved in the change at their own level. In this sense, the most important element for the smooth running of a Formula 1 single-seater, after fuel, is tires. Notorious for their poor composition, Pirelli, the official and exclusive supplier to Formula 1, is also making changes to meet its 2030 targets: the FSC-certified tyres. FSC certification ensures that the rubber used is natural and environmentally friendly. In addition, Pirelli has announced that all tires used during Formula 1 Grand Prix weekends will be transformed into secondary raw materials, as part of a circular economy initiative. The company also assures that all the electricity used in the tire production process comes exclusively from renewable sources. Pirelli promises that all tires will use "virtual" design technology, which not only saves a significant amount of time during development but

also minimizes the need for physical prototypes, hence using less materials. Additionally, they are implementing the removal of tire warmers for fully wet covers in Formula 1. It uses less electricity, having been introduced in Monaco the previous year. And ultimately Pirelli determined that, in order to reduce logistics emissions, sea freight would now be the favoured mode of transportation over air freight (Pirelli, 2024).

When looking at Pirelli's track record of being Formula One's official and exclusive tyre supplier, we can deduce that winning the call for bids multiple times in a row at the end of every contract means that Pirelli's objectives and corporate philosophy corresponds to what the FIA is looking for in F1. Moreover, when looking at the FIA's policy around their partners, we can clearly understand that the said partners have to meet certain requirements, for example: 'By 2025, all Members reach FIA 1 One Star Environmental Accreditation or equivalent' (Todt and Calderon, 2020). In their 2020 report on their environmental strategy turned toward 2030's objectives, the FIA explain that they want all members and partners to be in accordance with the sustainability governance. We can thus deduce that the FIA chose to keep Pirelli as the official and exclusive tyre supplier for the Formula One Championship because they have shown that they are working towards achieving carbon neutrality in 2030, and thus align with the FIA environmental strategy.

b) Formula One Group

As a part of the World Championships under the supervision of the FIA, Formula 1 is under clear instructions to take action in the Net Zero by 2030 plan. As explained earlier, F1 needs by 2025 to have a clear strategy for a carbon action plan, to have a platform where they can promote their environmental considerations on the future of automobile technology, to start the integration of 100% renewable fuel in the championship cars, and finally to reach the 3 stars FIA environmental accreditation. As we mentioned earlier, F1 was given the 3 stars FIA environmental accreditation in 2023 as a championship and to all teams competing; meaning that F1 achieved one of the objectives given by the FIA two years in advance, proving that the sport is making changes and that they are effective, but also that the influential power of the FIA as a governing body is powerful and successful.

i.Countdown to Zero

Following the signing of the UN "Sport for Climate" action framework, and the objectives for the sport set by the FIA, Formula One Group presented in 2019 their own sustainability strategy: Countdown to Zero. The main objectives are to lower the carbon footprint of the cars, the on-track activity, and the rest of the sports' operations. This framework was elaborated by sustainability experts, the F1 teams, the sponsors, and partners.

Throughout its history, Formula One has always been at the forefront of technological innovation by bringing advances in aerodynamism, security, energy recovery, navigation systems, composite materials that benefited the automotive industry in general by integrating them to road cars but also other motorsports. For this reason, F1 always has been called the « pinnacle of motorsport ». Stefano Domenicali, the actual president of the Formula One group said in: 'We believe that F1 can continue to be a pioneer for the auto industry, working

with the energy and automotive sectors to deliver the world's first 100% advanced sustainable fuelled power units, driving down carbon emissions across the globe. In launching F1's first-ever sustainability strategy, with an ambitious target to be a net zero carbon sport by 2030, we recognise the critical role that all organisations must play in tackling this global issue' (F1 & FUTERRA and Domenicali, 2021).

F1's action plan that aims to achieve carbon neutrality by 2030 is divided into four categories: on the track (races), on the move (transportation / logistic), where we work (F1 offices), and balance to zero (compensation for unavoidable emissions).

For the actions carried out on track directly, the goal is to showcase the most powerful and efficient cars in the world, but thanks to hybrid powertrains running on sustainable fuels. Because F1 has already produced one of the most competitive hybrid motors which gives faster lap times and lower fuel consumption, it now needs to add the last sustainable component: renewable fuel. As explained earlier in our study, the research around renewable fuel is in place, thanks to a collaboration between the FIA and Aramco.

Concerning the sustainability of F1's installations: offices, factories and production sites; the group aims for 100% powered by renewable energies. Mercedes F1 was the first international sports team to make long-term refinery capacity and book-and-claim model investments in sustainable aviation fuel (SAF). They have also examined their ground operations and their means of transportation to the races. They were able to introduce the use of biofuels in their delivery vehicles during the 2023 European season after a successful pilot program. This resulted in a 339 tonnes of CO₂ reduction in emissions overall. Furthermore, Mercedes have stated their goal for the 2024 season: to keep taking additional actions and looking into new avenues to incorporate sustainability into their operations at races. By using biofuels in their trackside generators and putting energy-saving measures in place in their paddock club, for instance, they are lowering the carbon footprint of race events. To lessen the need for lengthy transportation between races, the team has also begun to store some of the equipment in key regional locations. Similar to this, the hospitality suites and motorhome have done away with single-use plastics in favour of sustainable materials and recycling programs that support the team's waste minimization objectives (Ashpitel, 2024). As we can understand, Mercedes-AMG Petronas F1 team is one of the leaders amongst the other teams in terms of sustainability.

ii.A regional race calendar.

In an effort to render the Formula One's team logistic more sustainable, the Formula One group announced in July 2023 an optimised calendar for the 2024 season. Despite being the longest and most race packed season ever seen, F1 decided to change the order of the races, to try and regroup them in a geographic logic. This calendar shifts some races to better times in different places; for example, it moves Azerbaijan to September, Japan to April, and Qatar to race alongside Abu Dhabi back-to-back. The work will go on, but it will be realistic given that, being a world championship, there will always be travel that is necessary and cannot be fully regionalized due to climatic and contractual constraints.

2024 F1 Grand Prix calendar

02 March - Bahrain	09 June - Canada	15 September - Azerbaijan
09 March – Saudi Arabia	23 June - Spain	22 September - Singapore
24 March - Australia	30 June - Austria	20 October - Austin, USA
07 April - Japan	07 July - United Kingdom	27 October - Mexico
21 April - China	21 July - Hungary	03 November - Brazil
05 May - Miami	28 July - Belgium	23 November - Las Vegas
19 May - Emilia Romagna	25 August - Netherlands	01 December - Qatar
26 May - Monaco	01 September - Monza	08 December - Abu Dhabi

Still, we can ask ourselves why the entire calendar isn't perfectly organized by region or continent, which would make a significant difference in terms of energy expenditure around logistics. One of them is linked to the other major events that can take place in the country on the same dates as a Formula 1 Grand Prix. It's a great opportunity to host a round of motor-sport's premier class in your own country. Each Grand Prix attracts an average of 100,000 spectators over the course of the season. This represents a considerable number of potential customers who will stay in the hotels and have lunch in the restaurants in the towns around the circuits. The economic opportunity for the host countries is therefore considerable. Formula 1 stimulates a country's economy considerably over an extended week. It would therefore be regrettable if the Grand Prix weekend were to take place at the same time as another major national or international event, which would also attract large numbers of tourists.

It is therefore important to understand that, despite the demands of the FIA and the agreements signed, F1 can carry out sustainable and responsible projects, but it remains a sport, an international competition which welcomes thousands of spectators and thousands of workers, and which requires immeasurable organization and logistics. F1 can and does make great efforts to achieve carbon neutrality, but in certain respects it will unfortunately not be able to be the perfect pupil.

c) Conclusion on the influence of key institutions

We've seen from these two parts of our research that the FIA has indeed put in place a substantial and ambitious action plan, with numerous objectives to be achieved by 2030, but with the first milestone determined in 2025, we can't fully analyze the efforts made by the FIA and F1 more precisely. However, it's still very interesting to take stock of which objectives have already been achieved, or if some seem unattainable now that we're a year away from the checkpoint.

If we look at what remains to be done, we can see that the battle is not over, but that progress deserves credit. Indeed, a look at F1's 2023 report shows that the sport has managed to reduce its carbon footprint by 13% compared to 2018, meaning that only 37% remains to be cut. In addition, the percentage of F1 promoters using renewable energy sources to power their events in 2023 stands at over 75%, a rapid increase from 50% in 2022. To cite just one example, the Silverstone Grand Prix in England was powered solely by alternative green energies, including 2,746 solar panels and the use of Hydrotreated Vegetable Oil (HVO). In addition, as previously mentioned, the Formula 1 championship has maintained its

FIA 3-star environmental accreditation and has also become the first motorsport championship in the world where all teams hold this same status (FIA, 2024). What's more, a careful reading of the FIA's International Sporting Code, which governs the organization and running of all international motor racing competitions, reveals that the term "environmental officer" is one of a list of official and essential roles.

We can conclude that the FIA and F1 are well on the way to achieving and validating their objectives, as the various processes mentioned above have already been launched and are showing initial good results. By deduction, we can imagine that the 2025 action plan will have an even greater impact than that already demonstrated on F1's carbon footprint.

3. Impact of Public Opinion and Fans on F1's Environmental Agenda

a. Fans' Perceptions of F1's Sustainability Efforts and Their Impact

To understand the fan's impact on F1, we will consider the Social Influence Theory of Herbert Kelman. In his book, Kelman explains that individuals can accept social influence through three main processes: compliance which entails accepting influence to gain rewards or avoid repercussions, being mostly a temporary change of behaviour; the second is 'identification', it leads mostly to public conformity as the individual accepts influence only to maintain a satisfying relationship with the influencing agent. And the last process is through 'internalization', this is when an individual accepts the influence because it's in agreement with its own values, we consider this behavioural change durable in time (Kelman, 1974).

Indeed, if we look at the results of a survey made by the F1 Group in 2019, 75% of fans knew of F1's Net Zero Carbon by 2030 project, and 82% were happy of F1's efforts towards a more sustainable sport, leading to 59% thinking that those efforts had a positive impact on their view of the sport. As a result, F1 fans now hold the sport accountable to its environmental commitments, especially since 55% of fans believe that being the world leader in developing 100% sustainable fuels is their priority for F1. Moreover, 60% of the fans have shown that they are willing to comply with F1's sustainability goals through individual actions, thus reinforcing the importance for F1 to maintain and attain their goals (Fanvoice, 2024). In short, Formula 1 enthusiasts are extremely concerned about the sport's ecological footprint and expect concrete measures to reduce the environmental impact of single-seaters. According to the survey results, it's clear that fans attach great importance to sustainability and expect concrete measures to reduce the sport's ecological footprint.

Furthermore, what is interesting is seeing the changes that the sport has made for the growing fandom. Indeed, even if you are not an avid supporter of F1, you have probably heard about the Netflix show: Drive to Survive. Thanks to the documentary series, the sport has regained the craze it had lost in the last decade. The survey realized by F1 Group and Motorsport Network in 2021 recorded answers from fans in 187 different countries. First it shows that the response percentage is higher than the last survey done in 2017 (Drive to survive

started in 2019): 167,302 against 148,170, so an increase of 12.9%, showing the growing interest for the sport. Secondly it tells us that geographically, even if there aren't less Europeans fans they account for less as the sport grows and crosses borders: 57% of European fans in 2021 against 63% in 2017. But on the other hand, we can see a doubling of the number of fans in Asia-Pacific, Africa, and Middle East = 21% in 2021 against barely 10% in 2017 (Motorsport Network, 2021). And we can see the repercussion of this evolution in the change of the race calendar. While it is not pertinent to consider the 2020 race calendar because of Covid, we can see a clear difference between 2017 and today: European circuits like France, Germany, Portugal have been abandoned by F1 to profit the newer Grand Prix of Qatar and Saudi Arabia. There is also an increase in the number of races per season: 2024 will be the most packed year F1 has ever seen with 24 races on the calendar, against 20 in 2017. These numbers clearly indicates that F1 management takes into consideration the fans during the decision-making processes, recognizing the importance and the influence of the fans on the evolution of the sport on all levels. In conclusion, by using the Social Influence Theory as a framework to understand these survey results, we have shown that through normative, informational, and compliance-based influences, F1 fans have been able to shape the sustainability governance and decision-making within the sport. Thus, we can affirm that this fan-driven social influence has been a key factor in driving F1's sustainability agenda forward.

b. Fans' Influence on F1's Sustainability Decisions

As we have seen and understood, fans do have an impact sport in general, and in the case of Formula 1, we have found that the fans have a strong opinion on F1's sustainability projects and efforts. It is also important to understand that the concern over F1's sustainability governance is recent. In the 2017 edition of the survey realized by F1 and Motorsport Network, there isn't even a single mention of environment or sustainability, the questions weren't even asked because it wasn't really a conversation during those years; even if some initiatives from the FIA and F1 had started, the communication around them was not what it is today. But, because times have changed, in a survey conducted by Autosport in 2020, 67% of the fans thought that motorsports should support sustainable technology (Allen, 2020).

Because data that would prove that f1 fans are to thank for the growing efforts of the sport towards a greener future, let's think about it in the opposite direction: we will assume that because F1 wants to include fans in their sustainable strategy, it should mean that F1 thinks that the fans have an impact on sport and play their own part in helping F1 achieve their sustainability goals : F1 considers the fans as an actor of sustainability in the sport. As a result, we can observe that involving fans in Formula One's sustainability initiatives by teaching them about carbon reduction and encouraging environmentally friendly behavior has the potential to increase the sport's positive effects. Moreover, through showcasing the shift from an energy-intensive, high-profile sport to a sustainable one, fans of Formula One can learn a lot about environmental responsibility and the role that technology plays in this effort. Thus, insightful content, such as first looks at eco-innovations through interactive simulations or virtual reality experiences, can be used to effectively explain the complexities of sustainable racing technology and encourage a stronger emotional bond with the sport. Consequently,

this will foster a sense of collective accountability among followers (F1 & FUTERRA and Domenicali, 2021) (Miranda, 2023).

In conclusion, through the implementation of surveys, pledges, awareness campaigns, and sustainable practices, F1 is actively engaging its large fan base to promote a sustainable culture within the sport and drive tangible environmental impact. As F1's fans are open to and willing to support the sport's sustainability initiatives, we can confidently say that they are a crucial component of the sport's green transformation.

c. Comparing F1's sustainability governance to other motorsports:

As we previously discussed, F1 in terms of sustainability has advanced significantly, with a goal of lowering its carbon footprint and reaching net zero emissions by 2030. And with the help of several initiatives, such as recycling, the use of sustainable fuels, and renewable energy, the sport has reduced its carbon footprint by 13% from 2018 levels. Additionally, F1 has been acknowledged for its environmental sustainability; it has maintained its FIA Three-Star Environmental Accreditation and is the first motorsport championship in which every team has attained this distinction.

When we compare Formula One's sustainability governance to other motorsport, the result is clear: F1's strategy is thorough and determined. For instance, NASCAR's sustainability program has less defined objectives and less open reporting regarding its progress. Although IndyCar is using only 100% sustainable fuel, the Indianapolis Motor Speedway and its events are the primary focus of the series' sustainability initiatives. Although the all-electric Formula E racing series places a high priority on sustainability, its reporting and governance are not as thorough as those of Formula One (Brittle, 2023).

4. Diffusion of Sustainable Innovations and Best Practices

a. applying F1's technology to road cars and evaluating the Impact of F1's Sustainability Efforts

Throughout this paper we have talked about the many sustainable technologies and innovations that Formula One has brought to the world of motorsport, but for the last part of this paper we will look at the impact F1 has had on the automotive industry as a whole. In this sense, we will look back on the main F1 innovations that have now been applied to road cars.

Some people might not know, or forget about it, but the well known and used hybrid motors came from the pinnacle of motorsport. Indeed, Formula One is the pioneer of hybrid powertrains. Back in 2009 when it was formally introduced, engineers were afraid of the repercussions this change would have on the sport, because the famous noise of the single seaters were changing, and they thought that it would make the sport less exciting for fans. But the opposite happened, and the hybrid technology found in production cars like the Toyota Prius

has been directly influenced by the Kinetic Energy Recovery System (KERS) and Thermal Energy Recovery System (TERS) used in Formula One racing cars (Scott, 2017).

Moreover, in an effort to lessen the sport's carbon footprint, Formula One has been investigating the usage of sustainable biofuels and e-fuels as we talked about earlier. As automakers strive to decarbonize transportation, these alternative fuels are currently being tested and implemented in road cars, or the supply logistic of F1.

In addition, one of the main components that make a Formula One car a Formula One car is the material and its aerodynamics. The design of production vehicles has been directly impacted by the aerodynamic principles and technologies developed for Formula One racing: Spoilers, diffusers, and active grille shutters are examples of aerodynamic features that automakers have incorporated from Formula One to increase high-speed stability and fuel efficiency. In order to maximize vehicle aerodynamics, automotive R&D now frequently uses wind tunnel testing and computational fluid dynamics (CFD), two methods that were first used in Formula One racing. Because of Formula One's emphasis on reducing drag and increasing downforce, road cars now have more streamlined, fuel-efficient body shapes.

Exotic lightweight materials like carbon fibre, titanium, and magnesium are widely used in Formula One cars to reduce weight and boost performance. Important developments have been sparked by the creation and use of these cutting-edge materials in Formula One: High-performance and luxurious road cars are now equipped with carbon fibre body panels, chassis, and suspension parts. Lightweight aluminium and magnesium alloys have been used by automakers to lighten vehicles and increase fuel economy. Complex, lightweight components for production vehicles are now being produced using techniques like additive manufacturing, which was pioneered in Formula One. (Masterson, 2022).

All things considered, F1's culture of quick invention and technical prowess has made it possible for the sport to act as a testing ground for environmentally friendly innovations that are now widely used in the automotive sector and other fields. The transition of these developments from the racetrack to the streets shows how important motorsports can be in advancing the cause of a more sustainable future.

In conclusion, even if Formula 1's sustainability initiatives are still in their early stages, we can admit that they have the power to significantly alter the way sustainable mobility solutions and the circular economy are developed and implemented. Furthermore, our reflection leads us to believe that with F1 having the status of a well-known, technologically advanced industry, it definitely is a powerful testing ground for ideas that can later be expanded and used in other industries, ultimately fostering a more sustainable future.

Possible recommendation

As we approach the end of our research paper, we will now look into some recommendation that could be addressed to the FIA and the F1 Group.

An interesting possibility would be to strengthen the link between motorsport and automotive e-sport. E-sport refers to video game competitions organized on local networks or online on

consoles or computers. Whether professional or not, players can be part of a team, or play as individuals: they meet in competitions to win prizes and experience. In recent years, motor sport has become closely associated with e-sport, not least because of the health crisis: motor sport has had to cancel most of its events. To remedy this situation, speed enthusiasts have turned to video games, which are becoming increasingly realistic thanks to the new technologies used in recent racing simulations. There are even some e-versions of major races, such as Les 24h du Mans, known as the Le Mans Virtual Series. This event brings together renowned real-world drivers and e-sport champions, with the participation of real sponsors (FIA; Esport, 2021).

Consequently, the introduction of certain e-sport car races would considerably reduce greenhouse gas emissions: the logistics field would no longer be comparable at all. There would be no need to move dozens of tons of equipment from circuit to circuit, week after week. There would be no need for paddocks, cars, fuel or parts. What's more, it would also be possible to eliminate the greenhouse gas emissions directly linked to cars, such as exhaust fumes: the beneficial effect on the environment would then be reinforced. It would be significant.

Discussion and Conclusion

The results of the search offer insightful information about the existing literature and theoretical frameworks on sustainability governance in organizations and sports, especially as it relates to Formula 1 (F1) motorsports.

We came to the conclusion that Ostrom's Polycentric Governance Theory is a useful paradigm for comprehending sustainability governance in F1. The results demonstrate the involvement of several interdependent decision-making entities, such as the FIA, F1 management, teams, sponsors, and fans. Furthermore, our belief is that in order to address the complex environmental concerns the sport faces, a polycentric approach—as opposed to a centralized governing structure—is essential.

Our findings unambiguously demonstrate the applicability of the institutional theory to the analysis of the FIA and F1 Management group's impact on their sustainable project, demonstrating the significant influence that both the institutional body and the economic component of the FIA and F1 have over the sport's sustainable objectives.

Moreover, the Social Influence Theory underscored the essential role that Formula One (F1) fans play in the sport's administration. Their contributions and expectations have a lasting impact on F1's environmental agenda.

Finally, this study showed that Rogers' Diffusion Theory could be perfectly applied to Formula One Racing (F1R) in order to comprehend how and why the sport's sustainable ideas and technologies should be disseminated to the rest of the automotive industry and society. In closing, I would like to say that I think my study and findings can add to the scholarly discussion on sustainable governance in Formula 1 and other sports.

With implications for other sports and organizations experiencing comparable sustainability difficulties, the study project's findings provide a thorough and nuanced knowledge of the complex dynamics involved in sustainable governance within the context of Formula 1 motorsports.

For future research, I would like to be able to conduct and then analyse my own surveys and interviews. Even if I do believe that the data I used comes from an honest mind, I think I could add more specific questions, to get more details information and data, especially now that I have studied the subject. I also think that for future research, it could be interesting and compelling to add a study case on a particular team, to try and understand more precisely what they do or could do better at their level, and with their resources.

References

- Allen, J. (2020, 2 décembre). Formula 1 fans want sustainability and diversity, finds Autosport Survey. *Autosport*. <https://www.autosport.com/general/news/formula-1-fans-want-sustainability-and-diversity-finds-autosport-survey-4976723/4976723/>
- Amenta, E. and Ramsey, K.M. (2010) 'Institutional theory,' in *Handbooks of sociology and social research*, pp. 15–39. https://doi.org/10.1007/978-0-387-68930-2_2.
- Aramco (2022) *Formula 2 and Formula 3 partner with Aramco to pioneer low-carbon fuels from 2023*. <https://www.aramco.com/en/news-media/news/2022/formula-2-and-formula-3-partner-with-aramco-to-pioneer-low-carbon-fuels-from-2023>.
- Ashpitel, A. (2024) *The race to becoming one of the world's most sustainable professional sports teams*. <https://impact.economist.com/sustainability/resilience-and-adaptation/the-race-to-becoming-one-of-the-worlds-most-sustainable-professional-sports>.
- Brittle, C. (2023) *F1, Nascar and more: How are the top motorsport series tracking against their sustainability goals?* <https://www.blackbookmotorsport.com/features/f1-nascar-formula-e-extreme-e-indycar-sustainability-motorsport/>.
- *Executive Insights* (2024). <https://www.libertymedia.com/about/executive-insights>.
- F (2020) 'Lewis Hamilton tells fans 'I'm going to miss you' as he prepares for 'most difficult' F1 season | Formula 1®,' *Formula 1® - the Official F1® Website*, 25 June. <https://www.formula1.com/en/latest/article/hamilton-tells-fans-im-going-to-miss-you-as-he-prepares-for-most-difficult.4r9UbZwyyKRuYB92LolUEM>.

- F1 & FUTERRA and Domenicali, S. (2021) *SUSTAINABILITY STRATEGY*.
https://corp.formula1.com/wp-content/uploads/2021/09/Environmental-sustainability-Corp-website-vFINAL_UPDATED-040821-1.pdf.
- F1 (2024) 'How sustainable fuels can benefit the world – and are more than just the future of F1 | Formula 1®,' *Formula 1® - the Official F1® Website*, 17 April. <https://www.formula1.com/en/latest/article/how-sustainable-fuels-can-benefit-the-world-and-are-more-than-just-the.7wgO1hvSIoVBrVqpuL0sEc>.
- Fanvoice (2024) *Fanvoice : la solution pour décider, innover, influencer*.
<https://www.fanvoice.com/>.
- FIA (2021) *La FIA atteint la neutralité carbone et obtient la certification ISO 14001:2015 en 2021 conformément à sa stratégie environnementale*.
<https://www.fia.com/fr/news/la-fia-atteint-la-neutralite-carbone-et-obtient-la-certification-iso-140012015-en-2021>.
- FIA (2021). *Esports* <https://www.fia.com/esports>.
- Fisher, E. (2024) 'Liberty Media's History of Revving Up Success Bodes Well for MotoGP', *Front Office Sports*, 16 avril. <https://frontofficesports.com/liberty-medias-history-of-revving-up-success-bodes-well-for-motogp/>.
- Formula 1® (2024) *2023 FORMULA 1® IMPACT REPORT, 2023 FORMULA 1® IMPACT REPORT*. <https://corp.formula1.com/wp-content/uploads/2024/04/Formula-1-2023-Impact-Report.pdf>.
- Kelman, H. C. (1974). *Further Thoughts on the Processes of Compliance, Identification, and Internalization*.
- Kirouane, R. and Gherzouli, C. (2020) *Vers un quartier durable. Rôle du sport dans la réalisation des objectifs du développement durable: Cas d'étude Harratene-Jijel*.
<http://dspace.univ-jijel.dz:8080/xmlui/handle/123456789/5841>.

- Liberty Media Corporation Agrees to Acquire Formula One (sans date). <https://www.libertymedia.com/investors/news-events/press-releases/detail/139/liberty-media-corporation-agrees-to-acquire-formula-one>.
- Liberty Media. (2017) Liberty Media Corporation Completes Acquisition of Formula 1, Official press release, <https://d1io3yog0oux5.cloudfront.net/8267aa28a39e29a061d0b31e5b8fc787/libertymedia/news/2017-01-23-Liberty-Media-Corporation-Completes-Acquisition-305.pdf>
- Lines, G. (2001) 'Villains, fools or heroes? Sports stars as role models for young people', *Leisure Studies*, 20(4), pp. 285–303. doi: 10.1080/02614360110094661.
- Masterson, V. (2022) *5 surprising ways Formula 1 is changing the world*. World Economic Forum <https://www.weforum.org/agenda/2020/11/formula-one-f1-innovation-ventilators-fridges/>.
- Motorsport Network. (2021) Formula 1 in 2021 : Global fan insight into the world's largest annual sporting series (2005-2021), Management Report. F1, Motorsport Network, Nielsen Holdings plc. [Sondage Mondial des Fans de F1 2021 \(motorsport.com\)](https://www.motorsport.com/sondage-mondial-des-fans-de-f1-2021)
- Næss, H.E. (2017) 'Sandwiched Between Sport and Politics : Fédération Internationale de l'Automobile, Formula 1, and Non-Democratic Regimes', *International Journal Of The History Of Sport*, 34(7-8), p. 535-553. <https://doi.org/10.1080/09523367.2017.1371700>.
- Næss, H.E. (2018) 'The neutrality myth : why international sporting associations and politics cannot be separated', *Journal Of The Philosophy Of Sport*, 45(2), p. 144-160. <https://doi.org/10.1080/00948705.2018.1479190>.
- Næss, H.E. et Tjønndal, A. (2021) *Innovation, Sustainability and Management in Motorsports : The Case of Formula E*. <https://library.oapen.org/bitstream/20.500.12657/49508/1/9783030742218.pdf>.
- Nichols, G. et Savage, M. (2017) 'A Social Analysis of an Elite Constellation : The Case of Formula 1', *Theory, Culture & Society*, 34(5-6), p. 201-225. <https://doi.org/10.1177/0263276417716519>.
- *Nos partenaires* (2018). <https://www.fia.com/fr/nos-partenaires>.
- Paccard, P. (2009) *Réchauffement climatique et ressource neige en domaines skiables*. <https://hal.science/halsde-00387306/>.
- Pirelli (2024) 'PIRELLI'S MOTORSPORT FSCTM-CERTIFIED TYRES (FOREST STEWARDSHIP COUNCIL™) MAKE THEIR DEBUT IN FORMULA 1®,' *PI-*

RELLI'S MOTORSPORT FSC™-CERTIFIED TYRES (FOREST STEWARDSHIP COUNCIL™) MAKE THEIR DEBUT IN FORMULA 1®, 29 February. <https://press.pirelli.com/pirellis-motorsport-fsc-certified-tyres-forest-stewardship-council-make-their-debut-in-formula-1/>.

- Reiche, D. (2018) Issues around the FIFA World Cup 2018 in Russia: A showcase of how sports and politics mix: Wie die FIFA Fußball-Weltmeisterschaft 2018 in Russland exemplarisch belegt, dass Sport und Politik nicht voneinander zu trennen sind. *Sport und Gesellschaft*, Vol. 15 (Issue 2-3), pp. 283-296. <https://doi.org/10.1515/sug-2018-0013>
- Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.
- Scott, M. (2017) 'Could innovation in Formula One drive sustainable technology?,' *The Guardian*, 21 February. <https://www.theguardian.com/sustainable-business/innovation-formula-one-sustainable-technology>.
- *The Aramco and Aston Martin Racing strategic partnership*. (s. d.). Saudi Aramco. <https://www.aramco.com/en/what-we-do/energy-innovation/innovation-ecosystem/aramco-and-aston-martin-strategic-partnership>
- Todt, J. and Calderon, F. (2020) *FIA ENVIRONMENTAL STRATEGY 2020-2030 SUMMARY, FIA ENVIRONMENT & SUSTAINABILITY COMMISSION*. report. https://www.fia.com/sites/default/files/fia_environmental_strategy_v4_web.pdf.
- United Nations Climate Change (2018) *Sports for Climate Action Framework, Sports for Climate Action Framework*. https://unfccc.int/sites/default/files/resource/Sports_for_Climate_Action_Declaration_and_Framework.pdf.
- User Enovation Consulting (2024) *Understanding FIA environmental accreditation — Enovation Consulting | Sports and sustainability specialists*. <https://www.e-novationconsulting.com/news/fia-accreditation>.
- Venturoli, E. (2023) *Les 275 contrats de sponsoring de la saison 2023 de Formule 1*. <https://rtrsports.com/fr/blog/the-275-sponsorship-deals-of-the-2023-formula-1-season/>.

- Остром, Э. (2010) 'Beyond markets and states: polycentric governance of complex economic systems,' *the American Economic Review*, 100(3), pp. 641–672.
<https://doi.org/10.1257/aer.100.3.641>.