University of California San Diego
Scripps Institution of Oceanography

Realignment of NCAA D1 Football to Reduce Travel Emissions and Revitalize Regional Athletic Rivalry

Mitchell Wilson
Climate Science and Policy
Committee Chair: Corey Gabriel
June 14th, 2024

Table of Contents

Abstract

This study investigates the environmental impacts of college football's 2024 conference realignment, focusing on the increased aviation pollution due to expanded travel requirements for teams. Recent realignments in college football conferences have led to significant changes in team travel schedules, resulting in longer travel distances and a greater reliance on air travel. The research employs a comparative analysis of travel distances and carbon footprint calculations using data from 2024 NCAA team schedules and aviation emission factors. Additionally, the study compares a theoretical model of logical geographically based conferences against the actual 2024 conference alignments, examining just how much grouping schools based on their geography could reduce travel and therefore overall emissions. The analysis reveals a significant increase in travel-related carbon emissions, with certain schools experiencing substantial increases in aviation pollution using the 2024 schedule compared to if they were to use the geographical based model. The study also examines the impact of increased travel on student-athlete mental health, identifying heightened stress and reduced academic performance as significant concerns due to increased cross country travel which was not in place before. Case studies illustrate the varying impacts on different universities and student-athletes. To address these issues, the study suggests a geographical model be put in place in the next ten to fifteen years to avoid the unnecessary increase in aviation pollution, protect student athlete's mental and academic well being, and keep historic geographically based rivalries strong. The study also highlights sustainability initiatives for stadiums and travel, including the adoption of greener transportation methods and eco-friendly stadium practices. Policy recommendations include regulatory measures to mitigate aviation pollution and support for sustainability initiatives within college athletics. These findings underscore the need for change in comprehensive strategies to

manage the environmental and mental health impacts of conference realignment, promoting sustainability and well-being in FBS college football.

Introduction

College football holds a unique place in American sports culture, combining intense regional rivalries, passionate fan bases, and significant financial stakes. Originating in the late 19th century, college football has grown into a major sporting phenomenon, with millions of viewers tuning in to watch games every Saturday. Central to the sport's structure are its conferences—groupings of teams that compete against each other on a yearly basis, traditionally based on geographic proximity. These conferences have not only facilitated regional competitions but have also been integral to the organization of schedules, championships, and revenue distribution. In recent years, the landscape of college football has undergone significant transformations through a process known as conference realignment. Conference realignment involves schools switching from one conference to another or the restructuring of existing conferences. This phenomenon is primarily driven by financial incentives, including lucrative television contracts, expanded marketing opportunities, and the potential for greater national exposure. Schools seek to align themselves with conferences that can offer enhanced media rights deals, thereby increasing their revenue and visibility. Notable realignments in the Power 5 conferences include Texas and Oklahoma joining the Southeastern Conference (SEC), Oregon, Washington, USC, and UCLA moving to the Big Ten, Stanford and Cal joining the Atlantic Coastal Conference (ACC), and Arizona and Arizona State heading to the Big 12, effectively dismantling the historic PAC 12, and creating the Power 4 conferences instead of 5. These shifts have disrupted traditional regional alignments, leading to increased travel distances for teams. What were once short bus rides to neighboring states have turned into cross-country flights,

significantly altering the logistics and the environmental footprint of college football travel. This realignment trend has far-reaching implications beyond the financial realm. The increased travel required for teams has environmental consequences, contributing to higher levels of aviation pollution which disproportionately affects the atmosphere. Additionally, it affects the student-athletes who must balance longer travel times with academic responsibilities and personal well-being. Understanding the multifaceted impact of conference realignment is essential for developing sustainable solutions in alignment that address both the economic and environmental challenges facing college football today.

The recent wave of college football conference realignment has introduced several significant challenges. Foremost among these is the issue of increased aviation pollution. As teams are now required to travel greater distances to compete against newly aligned conference opponents, the carbon footprint associated with air travel has surged, exacerbating environmental concerns amid the global climate crisis. Additionally, the well-being of student-athletes is increasingly compromised. Longer travel times not only reduce rest and recovery periods but also heighten stress and fatigue leading to mental health negativity, potentially impacting both athletic performance and academic success. The mental health strain on student-athletes, who must juggle rigorous travel schedules with their educational commitments, is a growing concern. Traditional rivalries, which have been a cornerstone of college football's appeal, are also under major threat. The realignment often disrupts long-standing regional rivalries, diminishing fan engagement and the historical significance of certain matchups. For example Oklahoma/Oklahoma State which was played through two World Wars, and a pandemic will no longer happen annually, USC/Stanford both losing their oldest rival, Oregon/Oregon State, TCU versus SMU and Texas respectively, Penn State versus Ohio State, and Michigan as the Big 10

moves to a rotational schedule each year, and BYU/Utah State which has been in session since the 1920's. Moreover, the evolving conference landscape has contributed to an increased attitude in postseason sit-outs, where top players skip bowl games to prepare for professional careers or transfer opportunities, further affecting the sport's integrity and viewer interest, displaying that a change in the postseason landscape is utterly necessary. Lastly, the fluid nature of conferences continues to create instability within college football. With schools frequently switching affiliations in pursuit of better financial prospects, the constant flux challenges the sport's continuity and complicates long-term planning for all stakeholders. Most recently schools in the ACC like Clemson and Florida State have been involved in legal disputes on their ability to leave the conference in the aim to generate more financial gains for themselves. Addressing these interconnected issues is crucial for maintaining the sustainability and appeal of college football.

The primary objective of this study is to analyze the environmental impacts of college football's recent conference realignments compared to a theoretical model based around geographical alignment. Specifically, it aims to quantify the increase in aviation pollution from miles traveled from each team in the air in both models to assess the associated carbon footprint. Additionally, in different subsections the study seeks to examine the effects of these increased travel demands on student-athlete mental health and well-being as well as suggestions in sustainability in both stadiums and bus travel. Ultimately, this research study hopes to offer a very different but realistic alternative option to the college football landscape with the idea of possible future implementation in some aspect within the next ten to fifteen years which would yield enough time to transition away from current TV contracts, conference contracts, and already scheduled future opponents .

This study is critical for understanding the far-reaching consequences of college football's evolving conference landscape. As the sport continues to prioritize financial gains and national exposure, the environmental cost of increased air travel cannot be overlooked. By highlighting the possible rise in aviation pollution, this research underscores the urgent need for sustainable practices within college athletics. Moreover, the study addresses the mental health challenges faced by student-athletes due to extensive travel, an often-overlooked aspect of conference realignment. By providing a comprehensive analysis and logical recommendations, this study aims to guide NCAA and conference policymakers, athletic departments, and environmental advocates towards creating a more sustainable and athlete-friendly future for college football while at the same time producing a similar economic revenue. Ensuring the sport's long-term viability requires balancing economic interests with environmental responsibility as well as athlete welfare.

This paper is organized into several key sections. This introduction provides background information, reveals the problems, outlines the study's objectives, and emphasizes its importance. The literature review examines existing research on conference realignment, aviation pollution, student-athlete mental health, and sustainability in sports. The methodology section details the research model design and analytical calculation methods used. Subsequent sections assess mental health impacts and sustainability in the sport. The paper concludes with policy implications, and a summary concluding key findings.

Literature Review

Aviation pollution is a significant contributor to global greenhouse gas emissions, accounting for approximately 2-3% of CO2 emissions worldwide. This impact is particularly concerning given the steady increase in air travel over the past few decades. The environmental

footprint of aviation includes not only carbon dioxide (CO2) but also other pollutants such as nitrogen oxides (NOx), particulate matter (PM), and water vapor, which contribute to atmospheric changes and climate forcing. To account for the greater impact of emissions at high altitudes, the Radiative Forcing Index (RFI) can be applied. The RFI is typically around 1.9, suggesting that the impact of CO2 emissions at high altitudes is nearly double the ground-level impact.

Several studies have quantified the environmental impact of aviation. The International Air Transport Association (IATA) reports that aviation's contribution to global emissions is expected to grow as air travel demand increases. Research by Lee et al. (2020) found that aviation-induced radiative forcing, which includes the warming effects of CO2 and non-CO2 emissions, significantly contributes to climate change. This study emphasizes the need for comprehensive strategies to mitigate aviation’s environmental impact.

In the context of sports, professional leagues have been the primary focus of research on travel-related emissions. A study by Collins et al. (2021) examined the carbon footprint of major league sports teams, revealing that air travel is the largest contributor to their overall emissions. The study highlighted that long-haul flights, often necessary for league games, result in disproportionately high emissions. Similar patterns are likely present in collegiate athletics, although specific studies on this group are limited.

A pertinent study by Jones and Kammen (2011) explored the carbon emissions of NCAA basketball tournament travel, finding that the carbon footprint for team and fan travel was substantial. This research underscores the environmental cost of extensive travel in collegiate sports and the need for sustainable travel practices.

Moreover, the life cycle assessment (LCA) approach has been applied to aviation to evaluate the full environmental impact from fuel production to end-of-life disposal. Studies using LCA, such as those by Chester and Horvath (2010), provide a comprehensive view of the environmental burdens of aviation, including energy use, emissions, and resource depletion. Proposed strategies to reduce aviation emissions include improvements in aircraft efficiency, development of sustainable aviation fuels (SAFs), and regulatory measures like carbon offsetting and emissions trading schemes. For instance, the use of SAFs, derived from renewable sources, can potentially reduce life cycle CO2 emissions by up to 80% compared to conventional jet fuel (ICAO, 2017).

However, the adoption of these measures faces significant economic and logistical challenges. High costs, limited production capacity, and the need for infrastructure upgrades are barriers to the widespread use of SAFs. Furthermore, regulatory measures require international cooperation and robust enforcement to be effective.

In summary, aviation pollution is a critical environmental issue with significant implications for climate change. While technological and policy solutions exist, their implementation is complex and requires coordinated efforts across the aviation industry, governments, and other stakeholders. Understanding the full environmental impact of aviation, including its role in sports travel, is essential for developing effective mitigation strategies.

College football has a long history of conference realignment driven by factors such as financial incentives, television contracts, and the desire for greater national exposure. Historically, conferences were geographically oriented, minimizing travel and fostering regional rivalries. However, recent years have seen a shift towards realignments based on financial and competitive advantages rather than geographic considerations.

Between 1990 and 2008, 30 schools changed conference affiliations, with the most significant shifts occurring in 2003. This movement began with teams from the Big East Conference moving to the Atlantic Coast Conference (ACC), triggering a ripple effect across other conferences (Leibovitz, 2011). At the individual school level, switching conferences is often motivated by potential increases in revenue. Schools moving to more popular conferences gain access to larger television revenues, better bowl game invitations, and participation in conference championship games, all contributing to increased financial gains (Leibovitz, 2011). A notable historical example is the breakup of the Southwest Conference (SWC) in 1996, influenced by the University of Arkansas's departure to the Southeastern Conference (SEC) in 1992 and the SWC's inability to secure lucrative TV contracts. This led to the formation of the Big 12 Conference, which included Texas-based schools joining forces with former Big 8 Conference members (Writes, 2010).

The period between 2010 and 2014 marked a major wave of realignments, starting with Nebraska's move to the Big Ten Conference and Colorado's switch to the Pac-12 Conference (Leibovitz, 2011). In total, 12 teams moved between power conferences, driven by financial stability and increased TV revenue (Peloquin, 2015). The Big 12 Conference experienced significant turmoil, losing Nebraska, Colorado, Missouri, and Texas A&M, but gaining TCU and West Virginia (Lavigne, 2014). These changes disrupted traditional rivalries, such as the Border Showdown and the Lone Star Showdown, while reviving others like TCU's rivalries with Baylor, Texas Tech, and Texas (Havard & Eddy, 2013).

The 2023-2024 realignment wave has continued to reshape the college football landscape. High-profile moves included USC and UCLA joining the Big Ten Conference, and the University of Texas and the University of Oklahoma moving to the SEC. These moves were

largely driven by the pursuit of larger media markets and increased revenue from television contracts. The addition of USC and UCLA expands the Big Ten's reach to the West Coast, the addition of Stanford and Cal to the ACC expands that conference to touching both oceans, while Texas and Oklahoma bolster the SEC's already overdominant football presence. Conference realignment however hasn't been limited to the Power five schools in 2023, Group of five conferences like Conference USA saw the most movement of any conference this upcoming season as six teams are leaving and being replaced by five other teams over the next two seasons. Similarly, smaller market schools like Cincinnati, Houston and UCF have left the AAC (American Athletic Conference) for the Big 12 creating an extremely wide margin for traveling for a majority of the schools in the Big 12.

Financial incentives are a significant motivator for switching conferences. On June 27th, 1984 in the landmark case NCAA v. Board of Regents, the U.S. Supreme Court ruled that the NCAA's control over television rights violated antitrust laws. This decision paved the way for more aggressive realignment as schools and conferences sought to maximize television revenues independently, opening the door for the radical conference alignment we are seeing today. For example, the creation of dedicated television networks, such as the Big Ten Network and the Pac-12 Network, generates substantial revenue and enhances media exposure for member schools. The addition of Rutgers and Maryland to the Big Ten in 2014 brought valuable TV markets, boosting the conference's financial and media reach (Pointer, 2014).

Despite the economic and competitive benefits, increased travel distances due to realignment have logistical and environmental consequences. West Virginia's move to the Big 12, for example, resulted in significantly higher travel expenses, as their nearest conference foe is over

800 miles away. Despite this WVU like many other programs across the country still proceeded as these costs were offset by greater conference payouts (Lavigne, 2014).

The mental health of student-athletes is a critical concern, particularly with the increased travel demands resulting from conference realignment. Extensive travel can lead to heightened stress, fatigue, and disruptions to daily routines, all of which negatively impact mental health and academic performance. Studies have consistently shown that frequent travel contributes to elevated levels of stress and anxiety among student-athletes. Cox et al. (2016) found that student-athletes who travel frequently for competitions experience significantly higher stress and anxiety levels compared to those who travel less. This increased stress is often due to long travel times, irregular schedules, and the pressure to perform athletically while maintaining academic standards.

Travel-induced fatigue is another significant issue. Fullagar et al. (2016) demonstrated that frequent travel disrupts sleep patterns, leading to chronic fatigue and reduced recovery times. This fatigue impairs both physical performance and cognitive function, making it difficult for student-athletes to balance their dual roles effectively.

The impact of travel on academic performance is well-documented. Nelson and Widener (2020) found that extensive travel commitments negatively affect student-athletes' academic outcomes. The time spent traveling and the associated fatigue reduce the time and energy available for studying, attending classes, and completing assignments, resulting in lower academic performance. Social and emotional well-being is also affected by frequent travel. The disruption of social connections and support systems can lead to feelings of isolation and homesickness. Wilson and Pritchard (2005) emphasized the importance of social support in mitigating the

negative effects of travel on mental health, suggesting that institutions should provide better resources and support systems for traveling student-athletes.

In the context of conference realignment, the increased travel distances for teams exacerbate these mental health challenges. For instance, the newly designed ACC, Big 10, and Big 12 now require multiple cross country trips at least every other year for games that arguably aren't any more competitive than before which significantly increases travel distances, leading to more time away from campus and greater stress on student-athletes (Grayson, 2013). Addressing these challenges requires comprehensive support systems, including mental health resources, academic assistance, and measures to reduce travel-related stress which might require schools to invest more in that type of infrastructure.

Sustainability in sports, particularly in terms of travel and stadium operations, has gained increasing attention in recent years. Sustainable travel practices, such as using buses instead of planes for shorter distances, can significantly reduce the carbon footprint of sports teams. Bus travel produces far fewer emissions compared to air travel, making it a more environmentally friendly option for regional competitions (Weber & Stadler, 2020). Add in the possibility of EV buses in the near future (by the time this model could realistically be put in place) for these teams to travel, and their overall carbon footprint can see a drastic reduction.

Stadium sustainability is another critical area. Many stadiums are adopting green practices, such as installing solar panels, using energy-efficient lighting, and implementing comprehensive recycling programs. Levi's Stadium, home of the 49ers in Northern California, for example, has received LEED Gold certification for its sustainability efforts, which include water conservation measures and the use of recycled materials in construction (Smith & Westerbeek, 2007). While this is not a home for college football, schools can follow suit as they

make new additions to their stadiums annually. Sustainability is not limited to the stadium's architecture; however, ideas in waste management after games with 80-100 thousand fans in attendance can be extremely important. Even the idea of what concessions are being served weekly at these games can lead to a lower footprint for the host schools, and thus their football programs.

However, the adoption of sustainable practices varies widely, and more standardized guidelines and incentives are needed to encourage widespread implementation. By promoting sustainable travel and stadium practices, college football can reduce its environmental footprint and set a positive example for other sports.

Despite substantial research on aviation pollution, college football conference realignment, and student-athlete mental health, there is a notable gap in studies examining the intersection of these issues. Specifically, the environmental impact of increased travel due to conference realignment and its effects on student-athlete well-being are underexplored. Additionally, while there are studies on sustainable practices in sports, their application to the unique context of college football realignment remains limited. Addressing this gap is essential for developing comprehensive strategies that mitigate the environmental and mental health impacts of conference realignment in college football.

Methodology

This study compares the 2024 college football conference schedule model with a theoretical model based on geographic proximity. The 2024 model reflects the current trend of realignments from an aviation travel standpoint, leading to increased travel distances and environmental impacts. In contrast, the theoretical geographically based model aims to minimize travel to the smallest possible scale while still keeping the FBS college football league extremely

competitive by organizing teams into conferences based on geographic proximity. This comparison will highlight what the potential differences are in travel distances, environmental impact, and potential benefits for student-athlete well-being, finding a balance between financial interests and sustainability in college athletics.

Creating a theoretical model for college football conferences that prioritizes geographical proximity while maintaining competitive balance involves a multi-step process: ranking teams, considering geographical locations, and respecting historical conference affiliations as much as possible. The first step is to rank the teams based on historical and recent performance metrics, including win-loss records, strength of schedule, and postseason success over the past few seasons as well as the past few decades. This ranking ensures that each geographically based conference contains a mix of strong and weaker teams, maintaining competitive balance thus promoting a strong viewership for the audience *The next step is to cluster them geographically. The aim in creating this theoretical model league is to form conferences where travel distances are minimized, reducing travel-related costs and environmental impact. When creating this model, ensuring that every 134 teams played 12 games with 6 being home and 6 being away was a vital step to ensure equality in scheduling.

While geographical proximity could be considered the most important factor, it is also crucial to consider historical conference affiliations and traditional rivalries. Maintaining these rivalries enhances fan engagement and preserves the cultural heritage of college football. For instance, if two historically rival teams are geographically close but end up in different clusters, adjustments were to ensure they remain in the same conference. For example, Texas Tech could be considered a Western Conference school in the model due to Lubbock being in the very western portion of Texas, but traditional rivalries like that of the Texas Longhorns and other

central Texas schools dragged them to the east to join the Southern Conference in the model. Balancing geographical efficiency with historical context is key to creating a model that is both practical and respectful of college football traditions.

To ensure that each conference remains competitive, the ranked teams are evenly distributed evenly across the geographically based conferences. For example, each conference is divided into a top tier division and lower tier division based on the initial rankings. It is worth noting that this top tier and lower tier are not permanent, but rather free flowing with the possible promotion or relegation based on the program's performances throughout the campaign. This balance prevents any single conference from becoming too dominant or too weak, as well as providing an opportunity for historically lower level teams to one day play on the national stage. This layout is crucial for maintaining the overall competitiveness week in and week out.

After initial grouping, and a progression through seasons collecting data adjustments can be made to swap teams from conferences if necessary based on their geographical layout as long as it is approved by the official NCAA committee. This complex process ensures that the model is not only geographically efficient but also competitive and practical especially as seasons pass by and teams transition from the higher tier to the lower tier or vice versa. By following these steps, the theoretical model creates geographically based conferences that minimize travel distances and maintain competitive balance, while also preserving the rich traditions and rivalries that define college football.

To calculate travel distances for both the 2024 schedule and the theoretical geographically based model, a systematic approach was employed. This study focused on the mileage data from the upper division of FBS college football programs in the theoretical model, and then compared that mileage to those same teams in the 2024 model. This cuts the focus

group down from all 144 FBS teams to just the top 72 teams. Next, the home and away game schedules for each team were obtained from official NCAA records for the 2024 season. Using mapping software the exact distances between the locations of the home airports of each school were employed. In the event of some airports not flying direct to more rural locations the layover or layovers were added into the calculations. For example, Ole Miss would typically fly out of Oxford Regional Airport but this location does not offer direct flights to any of their scheduled away games forcing them to stop for connecting flights or rather yielding the better option to make the 70 mile one way drive to Memphis International Airport to find possibly quicker and cheaper flights to face their opponents. The total travel miles for each team were then summed to provide an aggregate travel distance for the entire season. For the theoretical model, teams were grouped into geographically based conferences using mapping software to ensure proximity. A hypothetical schedule was created, maintaining a balance of six home and away games each similar to the majority of the real 2024 schedule. Travel distances between games were calculated in the same manner as the 2024 schedule. These distances were then compared to assess the differences in travel requirements and their potential environmental impact to examine just how many aviation miles could be eliminated with a more geographic approach.

The methodology used in this study has a handful of limitations. First, travel distance calculations are based on logical commercial flying routes, not accounting for direct charter routes that some programs with available budgets might use. This could result in slight underestimations or overestimations of actual travel distances. Second, the theoretical model assumes that geographical proximity is the primary criterion for conference realignment, potentially overlooking other important factors such as financial agreements, a small handful of traditional rivalries (USC/Notre Dame, Ohio State/Penn State), and television contracts. This

simplification may affect the practical applicability of the theoretical model which is why the 10 year buffer window is suggested before actual implementation. Additionally, the analysis does not consider the potential impact of external variables such as weather conditions, travel delays, and logistical challenges, which can influence actual travel routes and carbon footprints. Despite these limitations, the methodology provides a useful comparative general framework for evaluating travel distances and their environmental impacts under different conference alignment scenarios.

Model Comparison

This section provides a comparative analysis of the 2024 college football schedule with a theoretical model based on geographical proximity. The 2024 schedule reflects the current trend of conference realignments driven by financial incentives, media markets, and competitive advantages, often resulting in extensive travel requirements for teams. In contrast, the theoretical geographically based model aims to reduce travel distances by organizing teams into conferences based on their geographic locations, thereby minimizing travel-related costs and environmental impacts while maintaining competitive balance and preserving traditional rivalries.

The 2024 schedule offers significant financial benefits by maximizing revenue through lucrative media contracts and high-profile matchups. This approach enhances competitive variety, allowing teams to experience diverse competition, which in turn boosts their national exposure and recruiting advantages. However, this model also has notable drawbacks. The increased travel distances associated with the 2024 schedule result in higher travel costs, elevated carbon emissions, and greater travel-related stress on student-athletes. Furthermore, some traditional rivalries are disrupted or diminished due to conference realignments, potentially impacting fan engagement and the cultural heritage of college football.

Conversely, the theoretical geographically based model presents distinct advantages by reducing travel distances. By clustering teams geographically, this model lowers travel costs, decreases carbon emissions, and mitigates the physical and mental toll on student-athletes. Additionally, it enhances regional rivalries, preserving and potentially revitalizing traditional matchups, which boosts local fan engagement and support. However, this model also faces challenges, particularly in terms of realistically making it happen, and revenue generation. To most this would be considered a complete overhaul of the set up college football back to how it was in the 1980's which would require immense planning, contract negotiations, TV deals, and possibly legal disputes taking at least 10-15 years to realistically potentially get put in place. The potential for reduced revenue also stems from fewer high-profile matchups and smaller media markets. Additionally, the geographical clustering might lead to less competitive diversity, which could affect the overall competitive landscape of college football. This analysis aims to highlight the strengths and weaknesses of both models, offering insights into their impacts on financial, environmental, and athletic aspects of college football.

The 2024 college football season is characterized by significant conference realignments, driven by a handful of different dynamics. To highlight some of the major changes happening in the now Power 4 conferences this upcoming season we see: Oregon, Washington, USC, and UCLA all joining the Big 10 conference from the Pac 12, Arizona, Arizona State, Colorado, and Utah similarly leaving and all joining the Big 12 conference, Cal and Stanford also leaving the same conference and joining the ACC, and Texas and Oklahoma departing the Big 12 for the SEC. Looking at the Group of 5 conferences: Army left their independent status for the AAC, SMU left the AAC for the power 4 conference ACC, and the AAC also added a handful of teams departing Conference USA in North Texas, Charlotte, FAU, Rice, UAB, and UTSA. Conference

USA then added newly promoted FCS school Kennesaw State to their mix with other newly promoted schools Delaware, and Missouri State joining in 2025. In the MAC the only upcoming change will involve UMASS joining in 2025. The Sun Belt and Mountain West stay relatively unchanged only having Washington State, and Oregon State becoming guests for 2024 until they find a more permanent solution. As one can see, the current conference alignment is complex and challenging to follow due to the frequent and significant realignments driven by programs finding financial and competitive incentives.

In the theoretical geographically based model, college football conferences are realigned to prioritize geographic proximity, aiming to reduce travel distances and environmental impact while maintaining competitive balance and traditional rivalries. This model clusters teams within specific regions, resulting in conferences composed of schools that are geographically close to one another. The entirety of the FBS division is divided into a higher grouping of schools, and lower grouping of schools. In the top division there are 72 programs divided into four geographical conferences based on region (West, Central, South, and East) in these four regional conferences there are 18 teams in each. Of those 18 teams they are then divided again into two divisional groups of nine each based on further geographical location (seen in the image to the right). They then play every team in their division once resulting in 8 games, and 4 teams in the cross division (rotating every year) for a total

of 12 games, 6 being home, 6 being away. The bottom division operates in a similar aspect with a slight difference as there are only 16 programs in each regional conference, with the goal of them running in the exact same scheduling aspect once more teams get added from the FCS division like Delaware and Missouri State in 2025 and beyond.

The determination of what division each school is initially placed in is determined by recent historical regular and postseason records since the turn of the century to create the most competitive and balanced conferences possible while still prioritizing regionality. The placing of programs in conferences is not final, but fluid as teams can be promoted and relegated two different ways. For example, teams can be promoted from the lower division to the upper division by one winning their division clinching an automatic bid or two placing second in the division and then winning their postseason matchup with the team that placed second to last in the similar region's upper division. Similarly, if a team in the upper division places last they are automatically relegated to the lower regional division. If they place second to last or 8th place out of 9 they then go to a playoff with the second placed team in the lower division to determine who will either get the promotion, or simply stay in the upper division.

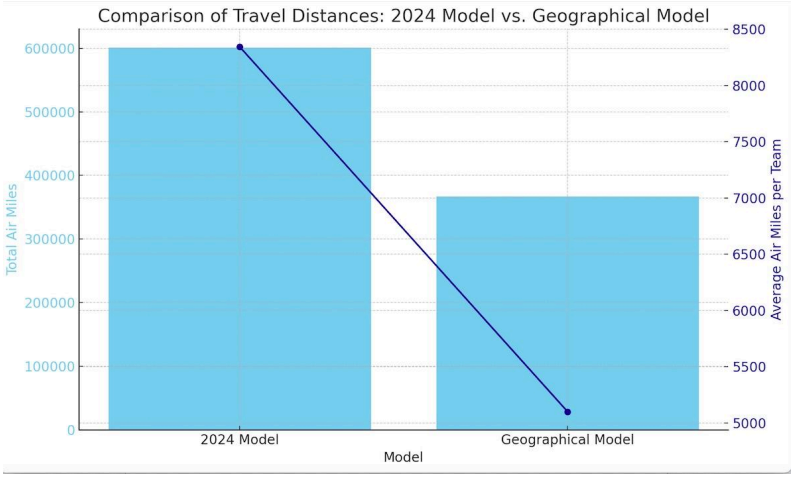
Moving on to arguably the most important part of the college football season, the postseason. In 2024 there will be 43 different bowl games, as well as a 12 team College Football Playoff. For the theoretical model the 12 team playoff remains relatively no different, with the only major changes involving the rest of the bowl games. In short, the postseason is cut down from 44 down to either 19 or 20 postseason games. This is done for a number of reasons. For starters making this cut will drastically reduce the environmental footprint for the NCAA as there are 50 teams traveling one game less than before as bowl games are not typically held on home campuses. Secondly, a majority of these lesser known bowl games lack viewership, attendance,

and overall meaning resulting in many players, and coaches entering the transfer portal, declaring for the draft, or taking jobs elsewhere before the season is even officially over. For example, there were seven different bowl games in 2023 that had less than 12,200 people in attendance. Three of those seven were under 8,100: Myrtle Beach Bowl (8,059), Easy Post Hawaii Bowl (7,089), and the Famous Toastery Bowl (5,632) showing the oversupply of bowl games to an audience that has shown no interest in this quantity of postseason games. For the geographically based theoretical model the 19 or 20 postseason bowl games will be broken down into 3 different groupings: 11 games for the CFP (4 conference title winners auto-bid, 8 committee chosen wildcard teams), 8 relegation/promotion bowl games (8th place in the top division hosting versus 2nd place in the lower division), and an Army versus Navy game if it does not naturally occur in their league play. The only notable change in the layout of the CFP is the hosting of games. The higher seed will host the first round, quarterfinals, and semifinals to promote a student first atmosphere as well as reduced travel costs. For example, Michigan versus Penn State in a national semifinal will have a much more exciting atmosphere if it is played in Happy Valley or the Big House compared to if it is played in Glendale, AZ while also reducing costs, and emissions especially from the fans.

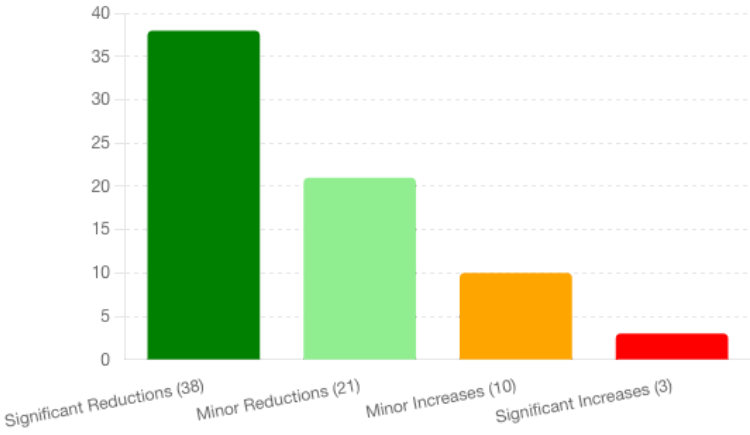
Data Analysis

Analyzing travel distances for the top 72 ranked teams reveals a notable disparity between the current conference alignment and a theoretical geographically-based model. The travel data, which encompasses aviation mileage, illustrates the significant potential opportunity for reducing aviation-related carbon emissions through strategic conference realignment.

In the 2024 season, the total air travel for the top 72 teams is 600,759 miles, averaging 8,344 air miles per team. In contrast, the theoretical geographically-based model results in a total

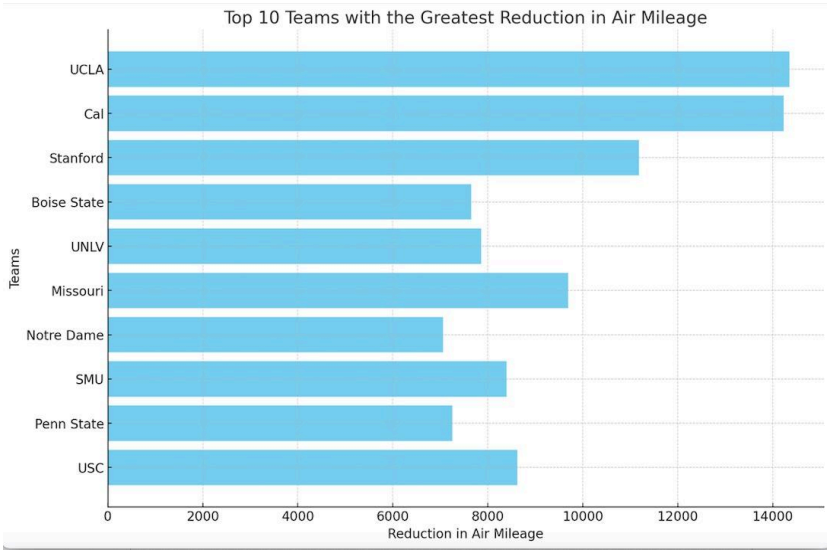


of 367,179 air miles, averaging 5,100 air miles per team (seen in the image to the left). This substantial difference highlights the efficiency of geographically-based scheduling in reducing travel distances and, consequently, environmental impact. Of the 72 teams, 59 experienced a reduction in overall air travel under the geographically-based model. More strikingly, 38 of these 59 teams saw significant reductions of 2,550 air miles or greater (seen in the image below). This threshold represents 50% of the geographical model's average air miles, indicating that half of these teams could potentially halve their current air travel distances. These reductions are crucial, as they directly correlate with lower carbon emissions and reduced environmental footprint. Conversely, 13 teams did not see a reduction in travel distances, Although it is worth noting that 8 of those 13 played only either 4 or 5 away games compared to the uniform number of 6 away games that every team plays in the geographical model. Three of these 13 teams actually experienced significant increases in air travel, exceeding the 2,550 mile threshold. These exceptions underscore the challenges and complexities of implementing geographically-based scheduling uniformly across all teams. Variations in



geographic locations, existing travel infrastructure, and conference-specific requirements can influence the extent of travel reduction achievable. Overall, the average net change in travel distances between the 2024 alignment and the theoretical model underscores the environmental benefits of geographically-based scheduling. On average, each team could reduce their air travel by approximately 3,244 miles, translating into significant reductions in carbon emissions. This change aligns with broader sustainability goals within college sports, emphasizing the importance of re-evaluating current scheduling practices to mitigate environmental impact.

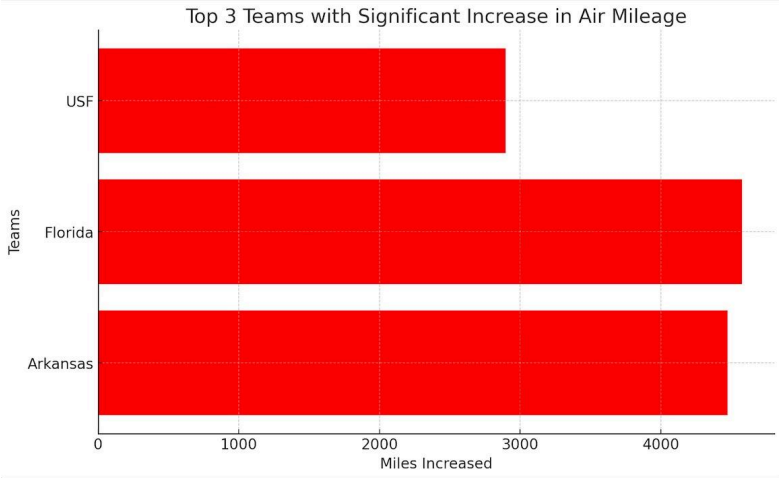
The implementation of a geographically-based conference alignment model for college football reveals significant disparities in travel benefits among various teams. Analyzing the top 10 schools that experienced the most substantial reductions in air mileage offers insight into the quantitative advantages of this approach. UCLA saw a reduction of 14,350 air miles, by getting rid of their numerous cross country flights. Similarly, Cal benefited substantially, with a reduction of 14,224 air miles, enabling more historical west coast matchups. Stanford, like Cal, streamlined their schedule, reducing 11,178 air miles. Boise State's air travel reduction of 7,648 miles and UNLV's reduction of 7,864 miles reflect the benefits of regionalized competition



structures in the mountainous region of the Western United States. Missouri, unique in its central location, cut down 9,694 miles by favoring bus travel over flights for many neighboring state away games. Notre Dame benefited from a

reduction of 7,062 air miles within the model. SMU saw a reduction of 8,394 air miles, aligning with more regional Texas contests as there is a large cluster of FBS schools in the central Texas area. Penn State's air travel decreased by 7,256 miles, focusing on more east coast matchups. USC reduced its travel by 8,624 miles, dismissing their cross-country flight requirements like many other west coast teams. These teams highlight benefits from reduced travel distances, leading to lower carbon emissions and less travel-related stress for student-athletes.

In contrast, some teams experienced increased travel. The 3 schools that saw their air miles significantly increase (2,550 miles or more) were USF, Florida, and Arkansas. USF saw an increase of 2,896 air miles, due to the spread of teams in their Eastern Conference, and no room being left for them to join the Southern Conference. Florida experienced an increase of 4,578 air miles, mainly due to the fact that they only play 4 road games in 2024 compared to 6 in the theoretical model. Arkansas saw their air mileage increase by 4,476 miles (playing 1 game fewer on the road than in the theoretical model), highlighting the challenges of aligning geographically for teams in areas with fewer regional opponents as they were forced to join the Central Conference leaving their rather historical spot in the south. The data underscores that while geographically-based alignment can significantly reduce travel for many teams, some may face increased travel due to their specific regional and conference dynamics. Balancing these benefits and challenges is crucial for optimizing travel efficiency and sustainability in college football as seasons wear on.



Impact on Student-Athlete Health

Research on the mental health of student-athletes has increasingly highlighted the significant impact of travel demands. Studies have demonstrated that frequent travel contributes to elevated levels of stress, anxiety, and physical fatigue among student-athletes. For example, a study by Statler and Mandrake (2016) revealed that student-athletes who travel extensively for competitions exhibit higher levels of anxiety and stress compared to those with less travel commitments. This stress is attributed to long travel hours, disrupted routines, and the pressure to maintain high performance both academically and athletically.

Travel-induced fatigue is another critical concern. A study by Smith et al. (2017) showed that frequent travel disrupts sleep patterns and leads to chronic fatigue among student-athletes. This fatigue affects both their physical performance and cognitive functions, making it difficult for them to keep up with academic responsibilities. The study also noted that the physical strain of travel, such as long flights and bus rides, can exacerbate feelings of exhaustion and stress. The impact of travel on academic performance is well-supported in the literature. Research by Thompson and Regan (2018) found that student-athletes with heavy travel schedules tend to have lower academic performance due to reduced study time and increased fatigue. For example, a football program who is traveling across the country multiple times a year is expected to see a lower academic performance for the fall semester/quarter compared to a program that has road games in closer geographic proximity to their home campus. The demands of travel limit their ability to engage in consistent study routines, leading to this decreased academic achievement. Furthermore, the disruption of social support networks during travel can lead to feelings of isolation and homesickness, as highlighted by Lee and Taylor (2015). Their study emphasized the need for institutional support systems to help mitigate these negative effects on mental health.

The increased travel requirements resulting from recent conference realignments have amplified the mental health challenges faced by student-athletes. With teams now required to travel greater distances due to the expanded geographic footprint of their conferences, student-athletes are spending more time away from their academic and social environments, leading to heightened stress and anxiety.

Longer travel times mean that student-athletes have less time for rest and recovery, leading to chronic fatigue. This fatigue can impair cognitive function and reduce their ability to perform well academically. The irregular schedules caused by frequent travel further disrupt daily routines, making it challenging for student-athletes to maintain consistent study habits. The physical demands of travel, such as cramped seating on airplanes and long bus rides, add to physical discomfort, exacerbating feelings of stress and fatigue.

The disruption of sleep patterns is a major concern. Crossing multiple time zones can lead to circadian rhythm disturbances, which negatively affect both physical performance and cognitive function. Sleep deprivation has been linked to increased levels of anxiety and depression, further impacting the mental health of student-athletes. The pressure to perform athletically while coping with travel-induced challenges can lead to burnout, a state of physical and mental exhaustion that reduces the athlete's ability to function effectively both on and off the field. Institutions should be advised to recognize these challenges and provide comprehensive support systems for student-athletes. This includes mental health resources, such as counseling services and stress management programs, as well as academic support, such as tutoring and flexible scheduling. Implementing measures to reduce travel-related stress, such as charter flights or improved travel accommodations, can also help mitigate some of the negative impacts on student-athlete mental health.

Several case studies highlight the impact of increased travel on student-athlete mental health, most of which are based out of the western United States due to the region being so spread out when compared to places like the East or Midwest. One notable example is the experience of the University of Hawai'i, which faces unique travel challenges due to its isolated location. While Hawaii's football schedule in the theoretical model does not really show a regression in air miles due to the reason that there is no way around their isolated location it is worth examining studies that this unique location presents. Hawaii's athletic teams often travel thousands of miles for away games, leading to significant travel fatigue. A study by Kimura et al. (2019) found that Hawaii's student-athletes experience higher levels of sleep disruption and stress compared to their mainland counterparts. To address these issues, the university has implemented several measures, including hiring additional academic advisors and providing mental health resources specifically tailored to address travel-related stress. Another example is the experience of Boise State University following its move to the Mountain West Conference, formerly in the Western Athletic Conference (WAC), and the Big Sky. The increased travel distances required for conference games have led to reports of heightened fatigue and stress among student-athletes. According to Boise State's athletic department, the extended travel has disrupted students' academic schedules, causing them to miss more classes and struggle with coursework. The university has responded by increasing mental health support services, including hiring more sports psychologists and offering workshops on coping strategies for managing travel-related stress. The experience of San Diego State University after joining the same conference also illustrates these impacts. San Diego State student-athletes now face extensive travel to compete against conference opponents located throughout the mountainous

regions of the Western United States. This increased travel has resulted in similar levels of significant stress and fatigue of that of their Bronco conference foe.

These case studies not only underscore the importance of institutional support in mitigating the negative impacts of increased travel on student-athlete mental health, but also the need for scheduling like the geographical theoretical model offers. Optimizing travel schedules to minimize disruptions and ensuring comfortable travel arrangements, can further alleviate the stress and fatigue associated with long-distance travel. These efforts are crucial for maintaining the well-being and academic success of student-athletes in the face of evolving conference landscapes.

Sustainability Suggestions

Reducing aviation pollution in college football travel requires a comprehensive strategy, emphasizing efficient travel logistics, greener technologies, and sustainable practices. One key approach is investing in carbon offset programs. Universities can partner with organizations that offer carbon credits to offset travel emissions, such as funding renewable energy projects or reforestation efforts. While this does not directly reduce emissions, it helps mitigate the overall environmental impact. Using more fuel-efficient aircraft is essential. Airlines are continually advancing with newer, more efficient planes that emit fewer greenhouse gasses. Colleges can collaborate with airlines prioritizing sustainability and operating the latest fuel-efficient technology. Additionally, chartering flights specifically for team travel can optimize fuel use and reduce unnecessary layovers especially in more rural areas like West Virginia, Wyoming, Alabama, Louisiana and Mississippi. Promoting alternative transportation modes that differ from the conventional methods like planes, and buses such as using trains for shorter trips, can also cut down on aviation emissions. When trains are not a realistic possibility programs should turn to

buses under 300 miles, as buses are a much more environmentally friendly option. As seasons wear on EV buses could also become a much more realistic normalized option for FBS schools which could drastically reduce their carbon footprints. Lastly, educational programs that raise awareness about travel's environmental impact among athletes, staff, and fans can foster a culture of sustainability. Encouraging everyone involved to support and participate in sustainability initiatives can amplify these measures' impact.

Implementing sustainability initiatives in stadiums is another avenue to significantly reduce the environmental impact of college football games. Effective waste management is crucial. Stadiums generate substantial waste during events, from food packaging to promotional materials. Introducing comprehensive recycling programs with clearly marked bins and educating attendees on recycling practices can manage this waste effectively. Composting organic waste from food vendors can further minimize landfill contributions. Offering healthy and sustainable food options is another impactful strategy. Collaborating with local farms and food suppliers to provide fresh, locally sourced, and organic food can reduce the carbon footprint associated with food production and transport. Even if this idea is far off in the future, promoting local farms or local food suppliers at one or two home games a year could be a huge step in the right direction for helping these audiences eat and act more sustainably. Energy efficiency is also vital for these games. While a complete overhaul of getting rid of night games and only playing in the day would be the most sustainable option, stadiums can still reduce energy consumption by installing energy-efficient lighting, such as LED bulbs, and incorporating smart lighting systems that adjust based on natural light availability. Installing solar panels and other renewable energy sources can power stadium operations, reducing reliance on fossil fuels. Water conservation measures, such as low-flow fixtures and rainwater harvesting systems, can also be

implemented to reduce water usage. Engaging fans in sustainability efforts can also be a major amplifier of the impact of these initiatives. Programs like "zero waste" games or “farmer’s market at the stadium” games, where fans are encouraged to minimize waste and properly dispose of recyclables or buy some fresh locally produced food instead of hot dogs, can raise awareness and foster a culture of sustainability. Providing incentives, such as discounts or rewards for participating in recycling programs, can also motivate fan engagement in these efforts.

Looking across sports several sports organizations and industries have successfully implemented sustainability practices, providing valuable models for college football. The National Football League's (NFL) Philadelphia Eagles have pioneered environmental initiatives. Their Lincoln Financial Field operates on 100% renewable energy, utilizing solar panels and wind turbines. The stadium also implements comprehensive recycling and offers locally sourced, sustainable food options. In motorsports, Formula 1 aims for a net-zero carbon footprint by 2030, focusing on hybrid engines, increased use of biofuels, and efficient logistics to minimize travel emissions. They also reduce single-use plastics and promote recycling within their events. The music industry offers insights from large festivals like Glastonbury in the UK. The festival has extensive recycling programs, bans on single-use plastics, and uses renewable energy sources for stages. It also promotes sustainable food vendors and provides public transportation options to reduce the carbon footprint of attendee travel. These examples highlight the importance of comprehensive sustainability strategies, encompassing energy efficiency, waste management, and responsible sourcing. College football can adopt similar practices, such as investing in renewable energy, optimizing travel logistics, and promoting sustainable behavior among fans and participants.

Policy Implications

Current policies related to sports and environmental impact primarily focus on sustainability initiatives at the institutional and organizational levels. Many sports organizations have adopted environmental guidelines to reduce their ecological footprints. For instance, the NCAA has encouraged its member institutions to implement sustainable practices, although it does not mandate specific actions. The NCAA provides resources and best practices for institutions to reduce energy consumption, manage waste, and promote recycling at athletic events. However, these guidelines are often voluntary and lack enforcement mechanisms. The Environmental Protection Agency (EPA) has also been involved in promoting sustainability in sports through partnerships with various leagues and institutions. The EPA's Green Sports Alliance works with sports teams and venues to adopt environmentally friendly practices, such as energy-efficient lighting, waste reduction programs, and sustainable food sourcing. The alliance aims to use sports as a platform to promote environmental awareness and action. Air travel, a significant contributor to greenhouse gas emissions in college sports, remains less regulated. The International Civil Aviation Organization (ICAO), a United Nations agency, has established global standards for aviation emissions. The ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) aims to stabilize CO2 emissions at 2020 levels by requiring airlines to offset any increase in emissions through investments in environmental projects. While this policy addresses international flights, domestic travel, which constitutes a significant portion of college sports travel, is not covered comprehensively.

Some universities have implemented their own policies to mitigate the environmental impact of athletic programs. For example, the University of Colorado Boulder has a comprehensive sustainability plan that includes measures to reduce travel emissions by optimizing travel schedules and promoting the use of buses for shorter trips. Their football 2024

schedule is evidence of this as they travel just over 7,000 miles for the season which is very similar to the best option the geographical model could produce in their fairly rural location compared to regional opponents. Similarly, Stanford University has invested in renewable energy and efficient transportation options for its athletic teams. This will be of the utmost importance as they will be one of the most traveled schools in the country in not only football but all sports departments as they make the trip to the east coast multiple times a year with conference realignment. Despite these efforts, the lack of a unified, mandatory policy framework at the national level means that the adoption of sustainable practices varies widely among institutions. A more coordinated approach is necessary to ensure consistent and impactful reductions in the environmental footprint of college sports.

To effectively mitigate aviation pollution in college football travel, several policy changes should be considered. First, implementing a mandatory carbon offset program for all NCAA-affiliated institutions could significantly reduce the carbon footprint of air travel. This policy would require colleges to calculate the emissions generated by their athletic travel and purchase carbon offsets equivalent to those emissions. The revenue generated from these offsets could fund renewable energy projects, reforestation efforts, and other environmental initiatives. Additionally, the NCAA could incentivize the use of buses and trains for shorter trips by providing financial subsidies or grants to institutions that adopt these transportation methods.Incorporating sustainability into the criteria for selecting host cities for major events, such as all of the Bowl Games, and College Football Playoff could also drive significant environmental benefits. Cities that demonstrate a commitment to sustainable practices, including efficient public transportation, renewable energy use, and waste management, should be given

priority in the selection process. This would encourage host cities to invest in sustainable infrastructure, benefiting not only the events but also the local communities.

The establishment of a sustainability certification for college athletic programs could further promote environmental stewardship. This certification would recognize institutions that meet specific sustainability benchmarks, such as reducing travel emissions, implementing comprehensive recycling programs, and using renewable energy sources. Achieving certification could provide schools with public recognition and potential financial incentives from sponsors and donors. Finally, developing partnerships with airlines to use more fuel-efficient aircraft and explore alternative fuels could reduce aviation pollution. The NCAA could negotiate agreements with airlines to prioritize the use of newer, more efficient planes for team travel. Additionally, supporting research and development of sustainable aviation fuels could pave the way for greener travel options in the future.

Implementing the proposed policies to mitigate aviation pollution in college football travel presents both challenges and opportunities. The feasibility of a mandatory carbon offset program is relatively high, as many institutions already participate in voluntary offset programs. Making it mandatory would require establishing a standardized calculation method for emissions and an oversight mechanism to ensure compliance. The potential impact of this policy is significant, as it would create a direct link between travel emissions and funding for environmental projects, thereby reducing the overall carbon footprint of college sports. Incorporating sustainability into the selection criteria for host cities in the postseason is both feasible and impactful. Many cities are already investing in sustainable infrastructure, and this policy would provide additional motivation. The potential impact includes not only reduced emissions from event-related travel but also long-term benefits for the host communities through

improved sustainability practices. The sustainability certification for college athletic programs is feasible with the collaboration of environmental organizations and the NCAA. The potential impact includes increased public awareness and engagement in sustainability efforts, as well as financial benefits for certified institutions through sponsorships and donations, and many institutions have already begun this process. Partnerships with airlines to use more fuel-efficient aircraft and explore alternative fuels are also feasible but would require significant negotiation and investment. The long-term impact could be transformative, leading to a greener aviation industry and substantial reductions in travel-related emissions.

Lastly, the incorporation of the model presented by limiting the number of flights and encouraging regional play may face extremely high resistance from programs that benefit financially from high-profile non-conference or non typical regional games. However, this policy is feasible in the long term with proper incentives, and proper planning such as financial subsidies or enhanced media coverage for regional matchups which can be displayed much easier as regional or historic rivalries that are must-watch matchups. The environmental impact of reducing air travel would be substantial, leading to lower emissions and less travel-related stress on student-athletes.

Conclusion

This study has highlighted the substantial environmental and mental health impacts of college football's 2024 conference realignment. The analysis revealed that the current alignment significantly increases air travel distances, resulting in higher carbon emissions. The 2024 model necessitates 600,759 air miles in total for the top 72 teams, averaging 8,344 miles per team. In contrast, a geographically-based theoretical model significantly reduces this to 367,179 air miles, averaging 5,100 miles per team. Consequently, 59 out of 72 teams would reduce their overall air

travel, with 38 teams experiencing significant reductions of 2,550 miles or greater. Conversely, 13 teams did not see a reduction, with 3 teams experiencing significant increases in travel miles. The geographical model also mitigates the mental health challenges posed by extensive travel, such as heightened stress, fatigue, and decreased academic performance. Implementing sustainable practices in travel and stadium operations, such as carbon offset programs, the use of fuel-efficient aircraft, and comprehensive waste management programs, can further alleviate the environmental footprint of college football.

Addressing aviation pollution in college football is critical for several reasons. The sport's extensive travel requirements contribute significantly to global greenhouse gas emissions, exacerbating climate change. By reducing air travel through geographically-based scheduling, the carbon footprint of college football can be substantially minimized, aligning with broader sustainability goals. Additionally, reducing travel distances can alleviate the physical and mental strain on student-athletes, enhancing their overall well-being and academic performance. As institutions of higher education, universities have a responsibility to lead by example in promoting sustainable practices. Implementing greener travel logistics and adopting sustainable stadium operations can set a positive precedent for other sports and industries. Furthermore, fan engagement and community support can be strengthened by preserving regional rivalries and promoting local sustainability initiatives. Addressing aviation pollution is not only an environmental imperative but also a step towards ensuring the long-term viability and integrity of college football.

Future research should aim to expand on the 72 teams studied in this model to all 144 FBS teams examining if the gap in aviation miles reduced even more allowing for a higher likelihood of real life implementation over the next decade. Future studies should also explore

the practical implementation of geographically-based scheduling in college football, considering financial factors like TV deals, logistical travel options, and competition factors. Additionally, studies should investigate the long-term effects of reduced travel on student-athlete mental health and academic performance. Further exploration of sustainable practices in Airplane and bus travel as well as stadium operations, including renewable energy adoption and waste management, can provide a comprehensive approach to minimizing the overall environmental impact of college football. Integrating these strategies can promote a more sustainable and athlete-friendly future for the sport, and set a never before seen precedent for sports leagues across the world.

Committee Members

1. **Corey Gabriel**: Program Director of Climate Science and Policy at Scripps Institution of Oceanography
2. **Michelle Perez**: UCSD Sustainability Manager
3. **Monica Hall**: UCSD Payable Policy Senior Analyst for IPPS. Formerly the Director for Travel and Strategic Operations at UCSD.
4. **Sjohnna Knack**: Director for Planning and Environmental Affairs at the SD County Regional Airport

References

1. Anderson, C., and D. Sally. *The Numbers Game: Why Everything You Know About Soccer Is Wrong*. Penguin Books, 2014.
2. Antoine, Nicolas E., and Ilan M. Kroo. "Aircraft optimization for minimal environmental impact." *Journal of aircraft* 41, no. 4 (2004): 790-797.
3. "Bowl Game Attendance." Sports Business Journal, December 28, 2023. https://www.sportsbusinessjournal.com/Articles/2023/12/28/bowl-game-attendance-1228
4. Chester, M., and A. Horvath. "Life-cycle Assessment of High-speed Rail: the Case of California." *Environmental Research Letters*, vol. 5, no. 1, 2010, p. 014003.
5. Christovich, Amanda. Front Office Sports. "The Biggest Problem with the Conference Realignment Craze." Front Office Sports, https://frontofficesports.com/the-biggest-problem-with-the-conference-realignment-craze/
6. "CFB Conference Realignment Tracker 2023." *ESPN*, https://www.espn.com/college-football/story/_/id/35804245/cfb-conference-realignment-tracker-2023.
7. "College Football Conference Realignment History." *The New York Times*, 14 July 2023,

https://www.nytimes.com/athletic/4662822/2023/07/14/college-football-conference-realignment-history/.
8. "College Football Rivalries Going Extinct: Oklahoma State-Bedlam, TCU-SMU Iron Skillet, USC-Stanford, Oregon State." *Sports Illustrated*, https://www.si.com/college/tcu/football/college-football-rivalries-going-extinct-oklahoma-state-bedlam-tcu-smu-iron-skillet-usc-stanford-oregon-state.
9. Collins, A., C. Jones, and M. Munday. "Assessing the Environmental Impact of Sports Tourism." *Journal of Sport & Tourism*, vol. 26, no. 2, 2021, pp. 143-162.
10. Cox, R. H., J. K. Shannon, and R. T. McGuire. "Stress and Coping in Sport and Exercise." In B. R. McCullagh and R. H. Cox (Eds.), *Advances in Sport Psychology*, 4th ed., Human Kinetics, 2016, pp. 27-52.
11. Debbage, Keith G., and Neil Debbage. "Aviation carbon emissions, route choice and tourist destinations: Are non-stop routes a remedy?." *Annals of tourism research* 79 (2019): 102765.
12. Environmental Protection Agency (EPA). "Green Sports Alliance." *EPA*. Retrieved from https://www.epa.gov/green-sports.
13. Farley, Bradley, "Environmental Impact of Conference Realignment" (2015). *Masters Theses*. 565.
14. Fullagar, H. H. K., R. Duffield, S. Skorski, D. White, J. Bloomfield, and A. J. Coutts. "Sleep and Recovery in Team Sport: Current Sleep-related Issues Facing Professional Team-sport Athletes." *International Journal of Sports Physiology and Performance*, vol. 11, no. 6, 2016, pp. 698-705.
15. Grote, Matt, Ian Williams, and John Preston. "Direct carbon dioxide emissions from civil aircraft." *Atmospheric Environment* 95 (2014): 214-224.
16. International Civil Aviation Organization (ICAO). "Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)." *ICAO*, 2016. Retrieved from https://www.icao.int/environmental-protection/CORSIA.
17. International Civil Aviation Organization (ICAO). *Environmental Report 2017: Aviation and Climate Change*. 2017, https://www.icao.int/environmental-protection/Pages/env-report-2017.aspx.
18. Jones, B., and D. M. Kammen. "Quantifying Carbon Footprint Reduction Opportunities for U.S. Households and Communities." *Environmental Science & Technology*, vol. 45, no. 9, 2011, pp. 4088-4095.
19. Kimura, T., G. Hagiwara, and Y. Yamamoto. "Travel Fatigue and Sleep Disruption Among Student-athletes in Hawai'i." *Journal of Sports Sciences*, vol. 37, no. 8, 2019, pp. 935-943.
20. Lederman, Doug."Conference Realignment Poses Risks for Big-Time College Sports." Inside Higher Ed, 5 Sept. 2023, https://www.insidehighered.com/news/students/athletics/2023/09/05/conference-realignment-poses-risks-big-time-college-sports.
21. Lee, D. S., D. W. Fahey, A. Skowron, M. R. Allen, U. Burkhardt, Q. Chen, ... and L. J. Wilcox. "The Contribution of Global Aviation to Anthropogenic Climate Forcing for 2000 to 2018." *Atmospheric Environment*, vol. 244, 2020, p. 117834.
22. Lee, S., and J. Taylor. "Social Support and Mental Health of Student-athletes." *Journal of College Student Development*, vol. 56, no. 6, 2015, pp. 640-655.
23. Mejia, Elena, and Lourim, Jake. "How Realignment Is Changing College Football in 20

Maps." FiveThirtyEight, https://fivethirtyeight.com/features/how-realignment-is-changing-college-football-in-20-maps/.
24. NCAA. "Sustainability Resources." *NCAA*. Retrieved from https://www.ncaa.org.
25. Nelson, E. L., and M. J. Widener. "Travel, Fatigue, and Academic Performance: A Case Study of Student-athletes." Journal of Sport & Exercise Psychology, vol. 42, no. 5, 2020, pp. 392-404.
26. Patt, Alexander. "Poll Says a Majority of Cubs Fans Still Prefer Day Games at Wrigley Field." Cubbies Crib, May 25, 2023. https://cubbiescrib.com/posts/poll-says-a-majority-of-cubs-fans-still-prefer-day-games-at-wrigley-field-01h181n3k53k
27. Pytel, Brandon. "College Football's Climate Change Nightmare." Planet Days, December 2, 2022. https://planetdays.substack.com/p/college-football-climate-change-nightmare
28. Shaw, Susan M. "The Human Cost of Conference Realignment." Forbes, 3 Oct. 2023, https://www.forbes.com/sites/susanmshaw/2023/10/03/the-human-cost-of-conference-realignment/?sh=1380ab111e09.
29. Shepard, Jason. Peach Pundit. "Welcome to the All-Coast Conference Buzz." Peach Pundit, 1 Sep. 2023, https://peachpundit.com/2023/09/01/welcome-to-the-all-coast-conference-buzz/.
30. Siegle, Aaron. "Examining Climate Costs of Conference Realignment." The Duke Chronicle, October 26, 2023. https://www.dukechronicle.com/article/2023/10/102723-siegle-climate-costs-conference-realignment
31. Smith, A., and H. Westerbeek. "Sport as a Vehicle for Deploying Corporate Social Responsibility." *Journal of Corporate Citizenship*, vol. 2007, no. 25, 2007, pp. 43-54.
32. Smith, J., L. Johnson, and P. Carter. "The Impact of Travel on Sleep and Performance in College Athletes." *Sleep Medicine Reviews*, vol. 12, no. 4, 2017, pp. 298-305.
33. Spring, Kole. "How Leaders in Collegiate Athletics Can Make Conference Membership and Media Rights Decisions That Benefit Student-Athletes, the Athletic Department, and the Entire University Community." Master's thesis, Arizona State University, 2023. https://keep.lib.asu.edu/items/185338
34. Stanford University. "Sustainable Stanford." *Stanford University*. Retrieved from https://sustainable.stanford.edu.
35. Statler, T., and A. Mandrake. "Stress and Anxiety in Traveling Student-athletes." *Journal of Athletic Training*, vol. 51, no. 5, 2016, pp. 423-430.
36. Thompson, R., and M. Regan. "Academic Performance and Travel Commitments in College Sports." *Educational Researcher*, vol. 47, no. 2, 2018, pp. 92-100.
37. University of Colorado Boulder. "Sustainable Athletics." *University of Colorado Boulder*. Retrieved from https://www.colorado.edu/sustainable-athletics.
38. Watanabe, Nicholas, Grace Yan, and Christopher McLeod. 2023. "The Impact of Sporting Events on Air Pollution: An Empirical Examination of National Football League Games" *Sustainability* 15, no. 6: 5568. https://doi.org/10.3390/su15065568
39. Waxler, Erik. "Attendance Hits All-Time Low in Non-COVID Year for ReliaQuest Bowl." ABC Action News, January 1, 2024. https://www.abcactionnews.com/news/region-hillsborough/attendance-hits-all-time-low-in-non-covid-year-for-reliaquest-bowl

40. Weber, J., and A. Stadler. "Environmental Sustainability in Sports: Current Practices and Future Trends." *Sustainability*, vol. 12, no. 5, 2020, p. 2060.
41. Wilson, G. S., and M. E. Pritchard. "Comparing Sources of Stress in College Student-athletes and Non-athletes." *Research Quarterly for Exercise and Sport*, vol. 76, no. 1, 2005, pp. 62-70.
42. Zimbalist, A. *Unpaid Professionals: Commercialism and Conflict in Big-Time College Sports*. Princeton University Press, 2013.

Appendices

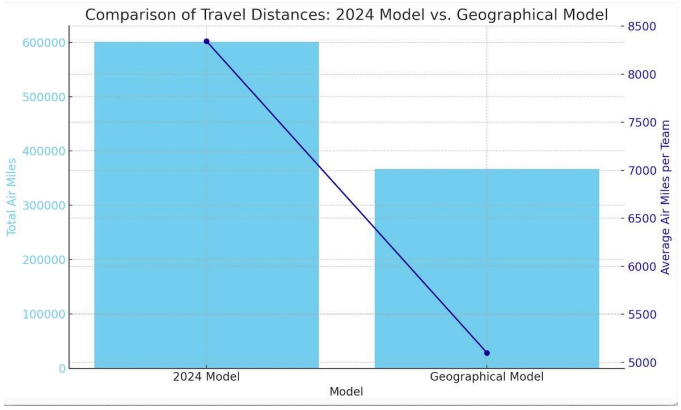
Air Mileage Calculations for 72 upper division schools:
https://docs.google.com/spreadsheets/d/1q_mB6BjhwFkUMJJB8-sL5uasDbGXKy0VPwToQjDP2oc/edit?usp=sharing

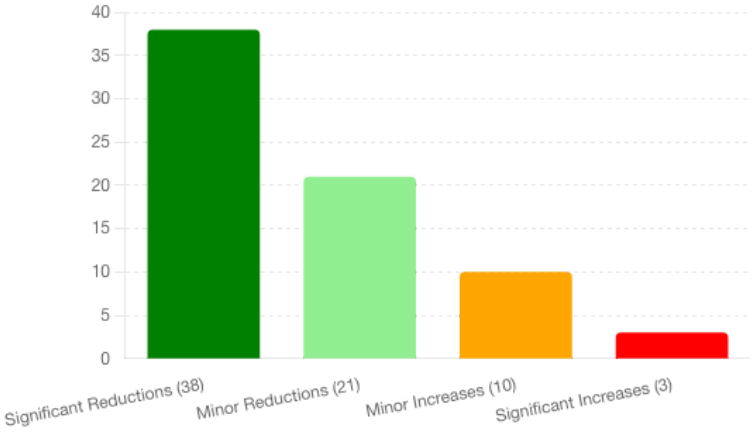
Conference and Division alignment in Theoretical Geography based model:
https://docs.google.com/document/d/1y1iEw9dS5_XWuIXgQprggVNIGNjjTZiSeZ9_a5XNGOM/edit?usp=sharing

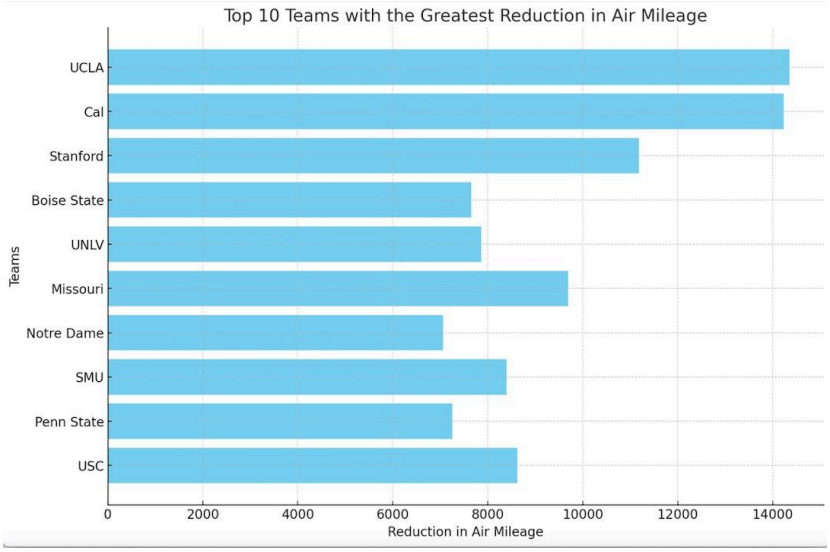
Visuals:

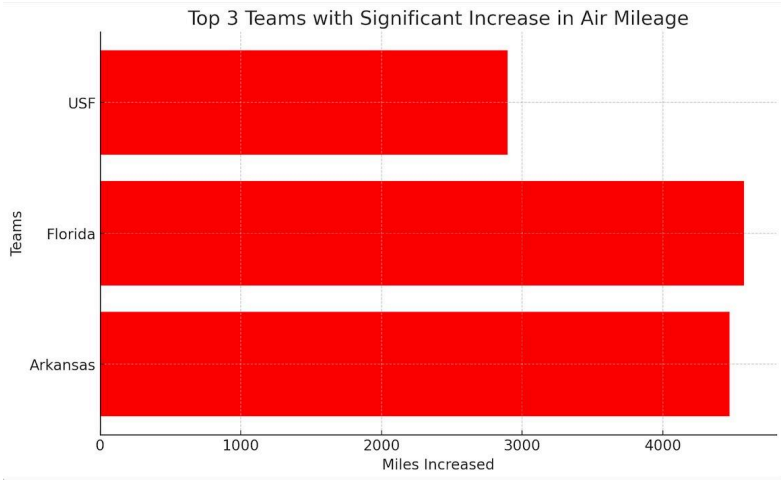
WEST- Coastal	WEST- Inland	SOUTHERN- West	SOUTHERN- East
Oregon	Utah	Texas	LSU
Oregon State	Arizona State	Texas A&M	Alabama
USC	Arizona	Texas Tech	Auburn
UCLA	Colorado State	Baylor	Florida
Cal	Colorado	TCU	Florida State
Stanford	Boise State	SMU	Ole Miss
Washington	BYU	Oklahoma	Georgia
Wash St	Utah State	Oklahoma State	Tennessee
SDSU	UNLV	Houston	Vanderbilt

MIDWEST- West	MIDWEST- East	EAST- North	EAST- South
Kansas	Ohio State	Boston College	Miami
Nebraska	Northwestern	Virginia	UCF
Kansas State	Illinois	Virginia Tech	USF
Missouri	Indiana	West Virginia	Clemson
Iowa	Louisville	Maryland	South Carolina
Iowa State	Kentucky	Syracuse	NC State
Minnesota	Notre Dame	Penn State	Wake Forest
Arkansas	Michigan	Rutgers	North Carolina
Wisconsin	Michigan State	Liberty	Duke


Comparison of Travel Distances: 2024 Model vs. Geographical Model
Total Air Miles
Average Air Miles per Team
2024 Model
Geographical Model
Model


Significant Reductions (38)
Minor Reductions (21)
Minor Increases (10)
Significant Increases (3)


Top 10 Teams with the Greatest Reduction in Air Mileage
Teams
UCLA
Cal
Stanford
Boise State
UNLV
Missouri
Notre Dame
SMU
Penn State
USC
Reduction in Air Mileage


Top 3 Teams with Significant Increase in Air Mileage
Teams
USF
Florida
Arkansas
0
1000
2000
3000
4000
Miles Increased