Climate Justice Implications of Banning Air-Freighted Fresh Produce

Subjects: Agricultural Economics & Policy

Contributor: Ebenezer Laryea , Amin Hosseinian-Far , Simon Derrick

Airfreight transport refers to the shipment of goods by air from one location to another and is often perceived as a contributor to global carbon emissions. The environmental impacts associated with airfreight are of notable and genuine concern. Such concerns have often led to calls for measures to ban or limit air freight as a mode of transportation for goods. Whilst the majority of these calls are perceived to be well placed, it is nevertheless essential to acknowledge the climate justice implications associated with such measures, particularly in the context of perishable products like fresh produce.

aviation logistics climate justice carbon footprint net zero airfreight fresh produce

1. Introduction

In recent decades, there has been a substantial increase in aviation activity involving both passenger and cargo transportation. This surge has consequently led to a notable uptick in greenhouse gas emissions within the aviation sector [1]. The rise in global population numbers and its corresponding implications for demand in aviation, coupled with the high perishability of fresh produce, accentuates the significance of air freight as a means of speedy transportation [2]. In fact, emissions associated with international aviation were approximated to be 36.8 million tons of CO_2e in 2019 [3].

Several studies have attempted to establish a correlation between rising global aviation and ecological sustainability [4][5][6]. A study undertaken in 2021 [7] argues that both CO_2 and non-CO_2 greenhouse emissions from global aviation are significantly exacerbating the climate change emergency. With each passing year, the signs of the worsening climate crisis find ever more clear expression in extreme record-setting weather events across the globe. This has led some major retailers to rethink their business models and procurement practices with respect to air-freighted fresh produce [8].

Its climate change implications notwithstanding, aviation logistics plays an instrumental role in supporting businesses and the livelihood of individuals, particularly vulnerable communities along the supply chain. However, there is a gap in research in this area, which examines the socioeconomic consequences and climate justice implications of a significant reduction in the growth of the aviation sector with respect to air freight.

2. Environmental Impact of Air-Freighted Fresh Produce

The main environmental concerns associated with aviation are climate change and stratospheric ozone reduction, which often leads to increased surface Ultraviolet (UV) radiation and pollution. Aircraft engines emit carbon dioxide, oxides of nitrogen, oxides of sulfur, water vapor, hydrocarbons, and particles that consist of sulfur oxides and soot [9].

Whilst a proportion of aircraft emissions are absorbed by the Earth's vegetation and oceans, a significant amount ends up in the atmosphere, where it blends with other gases to create the quasi-blanket over the globe. Consequently, heat, which normally radiates through our atmosphere and into space, is reflected onto the earth, thus causing our planet to warm. In

addition, Nitrogen Oxides (NOx) and H20 vapor from aircraft engines enhance the formation of cirrus clouds and contrails, which are visible in a clear day's sky and serve as yet more clear evidence of the carbon emissions attributable to aircraft [9].

Overall, aviation accounts for 2% of global CO_2 emissions. However, when non-CO_2 impacts on the world's climate are considered, aviation comes to account for 3.5% of global CO_2 emissions. The global aviation emission figure for greenhouse gas emissions (which includes all greenhouse gas emissions—not only CO_2 emissions is even lower at 1.9% [10]. Whilst these numbers may seem low, it is worth noting that aviation emissions have nevertheless doubled since the mid-1980s, and it is one of the most challenging sectors to decarbonize [10]. In a recent study, Lee et al. undertook a comprehensive year-by-year analysis of CO_2 emissions dating back to 1940 based on fuel consumption data from the International Energy Agency (IEA). From being well less than 100 million tons in 1940, aviation CO_2 emissions quickly quadrupled to being between 200 and 300 million tons in 1966. It then further doubled to just over 500 million tons in 1987 [7]. The financial crisis of 2008 saw a reduction in aviation, which resulted in a break in the sharp rise in aviation CO_2 emissions. Even then, the level of global CO_2 emissions caused by aviation (including airfreight) was recorded as being slightly over 700 million tons. A slow global economic recovery from the shocks of the 2008 financial crisis saw aviation activity pick up again in the 2010′s. As a result, an extremely sharp rise of 1.04 billion tons of CO_2 emissions from global aviation was recorded in 2018 [7].

The COVID-19 pandemic and its associated lockdowns exacted a heavy toll on the global economy. The suspension of conventional commercial activity and the movement of people across several countries across the world brought global aviation to a screeching halt, resulting in a sharp drop in CO_2 emissions. This meant that in 2022, aviation came to account for 2% of global CO_2 emissions, representing 80% of pre-pandemic levels [11].

What this analysis shows is that whilst CO_2 emissions from global aviation (including airfreight) have increased eightfold since the 1940′s, they still account for a relatively small proportion of overall global CO_2 emissions. Nevertheless, the levels of CO_2 emissions and their impact on the climate continue to remain a concern for many, resulting in political action across the world to progress the aviation industry towards carbon neutrality. The steps that have been taken by governments and political institutions in this regard have mostly found expression in the form of initiatives, fiscal and (or) regulatory policies intended to promote Sustainable Aviation Fuels (hereafter referred to as SAF) in major markets and thereby limit emissions reductions [11]. A notable example of this is the 'long-term global aspirational goal' (LTAG), which was adopted in 2022 by the 184 member countries of the International Civil Aviation Organization (ICAO). The goal behind LTAG is to achieve net carbon emissions from international aviation by 2050 [11]. Further to this initiative by ICAO, there are examples of direct fiscal policies and regulations by governments (mostly in the Western developed world) aimed at promoting sustainable aviation fuels in major markets to drive down aviation emissions. In 2022, the United States announced import tax credits and a grant program under its new Inflation Reduction Act to incentivize a pivot towards the use of SAF. The incentive package includes an allocation of $3.3 billion to scale up SAF production [11]. Similarly, the EU Parliament and Council reached a political agreement in early 2023 on a proposal called 'ReFuelEU Aviation' to decarbonize the aviation sector by requiring fuel suppliers to blend SAFs with kerosene in increasing amounts from 2025. On its own, this measure is projected to reduce CO_2 emissions by two-thirds. Other measures in the agreed 'REFueIEU Aviation' proposal include a requirement for airports to update their infrastructure to ensure that it can support SAF distribution [12]. The UK has taken a similar approach to the EU and unveiled the 'Jet Zero' pledge in 2022. 'Jet Zero' is a commitment by the UK government to support SAF projects with a £165 million investment. This investment will fund a plan to have at least five commercial SAF plants under construction by 2025. To support the achievement of this aim, the UK government set up the 'Advanced Fuels Fund' in July 2022 to competitively allocate the £165 million investment in grant funding to support UK advanced fuel projects until 31 March 2025 [13].

The commitment of governments and stakeholders in major markets, such as the UK, US, and EU, to support SAF production and advance the aviation industry's efforts to reduce CO_2 emissions is evident. Despite the aviation sector's relatively small contribution to global CO_2 emissions, the policy and fiscal measures discussed herein underscore the determination to reverse the significant increase in emissions from this sector. These measures highlight a collective drive to address environmental concerns and promote sustainable practices within the aviation industry.

2.1. Aviation and the Others

To gain a comprehensive understanding of aviation's impact on global greenhouse gas emissions, it is crucial to compare the emissions from the aviation sector with those of other major sectors. This comparative exercise enables us to assess and evaluate how aviation emissions fare in comparison to other significant contributors to global emissions. By considering aviation alongside other industries, we can gain insights into its relative environmental impact and better contextualize its role in the broader emissions landscape.

Within transportation, road transport (including road freight) is by far the biggest contributor to emissions, accounting for 11.9%. By contrast, shipping contributes 1.7% whilst aviation accounts for 2% of transport emissions, as has already been highlighted in this research. Rail and pipeline transports account for 0.4% and 0.3% respectively. As can be seen from this immediate data, aviation ranks amongst the least contributors to global emissions when compared to the emissions contributions from sectors within transport and other sectors within the wider Energy bracket [14].

Agriculture, forest, and land use contribute a total of 18.4% of global emissions. Livestock and manure are the most significant contributors within this sector, followed by emissions from agricultural soils and crop burning. Deforestation is also a notable contributor to emissions in this sector. It is worthy of note that when compared to the emissions contributed by aviation, only cropland and grassland activities contribute less, with all other agricultural activities contributing more than aviation to global emissions.

The industry processing sector contributes 5.2% of global emissions. Most emissions from this sector come from the production of chemicals and cement. When compared with aviation, this sector contributes more to global greenhouse gas emissions. This again demonstrates the fact that whilst the contribution to global emissions from aviation raises concern, they contribute relatively little to global emissions overall when compared with emissions from other commercial activities.

2.2. Banning or Limiting Air Freight—The Environmental Case

As this research has established, aviation, including airfreight, contributes a relatively negligible amount to overall global emissions. This, therefore, raises the question: What is the environmental rationale for restricting or prohibiting air freight, and what potential advantages might such an approach offer?

An initial answer may well lie within the environmental impact per unit of airfreight. Although aviation's emissions may be small compared to other industries, the emissions intensity and global warming potential of air-freighted fresh produce can be between 20–26 times the global warming potential of locally sourced fresh produce. Airfreight produces a higher amount of emissions per kilogram of goods transported compared to other transportation modes like shipping or train freight. As a result, using airfreight to transport fresh produce has a more significant environmental impact [15]. However, recent studies have demonstrated that business models associated with air freight and air cargo have a positive impact on local communities, e.g., alleviating poverty in rural communities [16][17].

With many retailers having become increasingly aware of their environmental impact and the need to address climate change, some see limiting or banning air-freighted fresh produce as beneficial to reducing their carbon footprints [15]. This perceived benefit has led to a proliferation of environmentally conscious sourcing policies, which are viewed as being a positive step towards sustainability and are seen to resonate with environmentally conscious consumers as a means of boosting market reputation and customer loyalty [18]. In addition to this, carbon neutrality and emissions reduction goals are playing a major role in shaping the disposition most food retailers are taking to air-freighted fresh produce. Most retailers have set ambitious targets in this regard and have done so in a way that means there is public pressure to deliver on emissions reduction targets [19]. For example, the British Retail Consortium established the 'Better Retail Better World' initiative, under which thirty major food retailers have come together to set and pursue emissions reduction and other sustainability targets. The group of signatories under the initiative has expanded to include big-name fashion brands as well [20]. Public commitments to emissions reduction targets, while necessary and appreciated, create consumer expectations that these targets will be achieved. In such scenarios, restricting or potentially banning airfreight may seem like a straightforward action to showcase a commitment to meeting climate emission reduction goals.

In addition to consumer pressure to reduce carbon emissions, retailers may also face regulatory and market pressures to reduce emissions. In such a situation, limiting or banning airfreight might appear to be a proactive measure to comply with existing or potential future environmental regulation—especially as the global economy draws ever closer to its Net Zero by 2050 target [21]. An example of this can be seen in the regulatory restrictions adopted by the EU parliament (Regulation (EU) 2021/1119) on centralized commercial refrigeration systems (including that of retailers and supermarkets) from 1 January 2022, which limits the global warming potential of the refrigerants [22]. Regulations such as this apply pressure to market actors and drive them towards changing their commercial behaviors and practices to meet future environmental targets.

2.3. Banning or Limiting Air Freight—The Business Case

Having examined the environmental rationale for banning or limiting air freight, it is equally valid to explore the business advantages in order to gain a comprehensive understanding of how such an approach might align with the financial interests of retailers. Whilst airfreight offers speed and reliability, it is often more expensive than other modes of transportation. Retailers may, therefore, consider optimizing their supply chains to use more economical and environmentally friendly transport options [23]. In 2021, the cost of flying cargo reached unprecedented heights, with prices nearly doubling on vital air freight routes. This surge in costs can be attributed to supply chain shocks lingering from the aftermath of the COVID-19 pandemic, a reminder that the global economy is still on the path to complete recovery. In the face of these challenges, some food retailers are open to exploring alternatives to air-freighted fresh produce to cut costs amidst the turbulence of changing market dynamics [24]. Further to the cost-cutting benefits, limiting or banning airfreight might make business sense for the supply chain efficiency streamlining opportunities it offers. The adaptation of more eco-friendly modes of transportation could allow retailers to optimize inventory management, reduce lead times, and enhance overall efficiency to boost customer satisfaction. With airfreight, businesses often prioritize speed, leading to smaller, more frequent shipments. However, this can result in higher inventory carrying costs, as warehouses may need to accommodate smaller quantities of goods more frequently. By adopting more efficient transportation modes, retailers can consolidate shipments, reducing the need for frequent restocking [25].

The business case for limiting or banning air freight stretches to include risk mitigation as well. A heavy reliance on air freight can expose retailers to various shocks and risks caused by weather conditions, airport closures, or other logistical challenges. Set against this backdrop, diversifying transport options and limiting reliance on air freight can mitigate the risks of external political and economic shocks and ensure smoother operations [26][27]. In no recent example is the fragility of supply chains,

which heavily rely on air freight, more evident than with the COVID-19 pandemic [28]. The pandemic placed unparalleled stress on food supply chains. Air freight, essential for fruits and vegetables especially, was severely disrupted by the decline in passenger air travel. To some extent, the legacies of this disruption continue to remain and affect the commercial operations of retailers and producers alike [29][30][31].

In sum, there is, *prima facie*, a strong environmental and business case that can be made for an approach to sourcing fresh produce that bans or limits the use of air freight. As has been already noted in this research, whilst airfreight is known for its speed and reliability, it comes with a higher carbon footprint compared to other transportation modes like sea or rail freight. By shifting to more eco-friendly options, retailers can demonstrate their commitment to sustainability while also unlocking operational advantages. In addition to this, limiting or banning airfreight can yield significant business benefits beyond cost-cutting, as has been highlighted in this research.

However, retailers and other industry actors must approach decisions regarding banning or limiting air freight with careful consideration of various factors, such as product suitability. It is essential to acknowledge that certain products, like fresh-cut fruit, have unique characteristics that make them better suited for air freight due to their perishability and specific customer demands for freshness [32]. Fresh-cut fruit has a very limited shelf life, thus requiring swift transportation to maintain its quality and appeal to customers. Air freight's speed and efficiency make it the transportation mode of choice for such perishable goods, ensuring they reach their destination quickly and in good condition. This is especially crucial when serving markets where demand is high for fresh products, and time-sensitive deliveries can be a competitive advantage [32].

Retailers and other industry actors must, therefore, strike a balance between sustainability goals and meeting customer expectations. Whilst limiting or banning the use of air freight is essential for environmental reasons, it is equally vital to ensure that customers receive products of the expected quality and freshness. It is certainly the case, therefore, that exploring alternative solutions to enhance the overall sustainability of the fresh produce supply chain, such as using sustainable aviation fuels or optimizing inventory management, can be valuable strategies that help to balance the need for sustainability against other equally significant factors [33]. Careful thought must also be given to the socioeconomic consequences and impacts of limiting or banning air-freighted fresh produce at the point of source, which is often a geographical location in the developing world. Particularly, decisions to ban or limit air-freighted fresh produce may go against the principles of Climate Justice and can have far-reaching impacts on various stakeholders and communities involved in the supply chain.

3. Climate Justice Perspective

Climate Justice is a concept that seeks to address the unequal and disproportionate impacts of climate change on different communities and individuals. It represents a recognition that climate change is not just an environmental issue but also a social and economic one. At its core, climate justice advocates and emphasizes the need to address the underlying causes of climate change in a manner that ensures fair and equitable approaches to climate change policies that prioritize the most vulnerable communities [34]. A key characteristic of Climate Justice is the highlighting of historical and geographical differences in climate impacts and the role of systems such as colonization, capitalism, and globalization in perpetuating climate injustices. It acknowledges that marginalized communities, especially in developing countries, who have contributed the least to climate change often bear the greatest burden of its consequences and the unintended negative impacts of policies designed to tackle it. Climate justice, therefore, emphasizes the imperative of ensuring that approaches aimed at addressing climate change (including those undertaken by retailers and other commercial entities) are equitable and considerate of the well-being of vulnerable communities. It strives to confront and dismantle these oppressive systems, ultimately working towards a future that is both fair and sustainable [34].

Climate change and justice share an inextricable link because climate change is at the root of the issue of fairness in a finite world where resources and the capacity of our planet to absorb carbon emissions are limited. Therefore, the issue of climate change cannot be satisfactorily addressed without the promotion of justice being placed at the center of the crafting of climate policy. This means responding to climate change requires a commitment to fairness [35]. The importance of climate justice in achieving global climate targets has long been established and recognized. As a substantive starting point, the Paris Agreement allowed for voluntary cooperation between countries for sustainable development using market-based mechanisms in a manner that ensures that efforts to address climate change are supportive of the most vulnerable communities [36].

As a social institution, the market shares institutional philosophical underpinnings with the concept of justice, thus embedding them both, arguably, in a set of interconnected values and relations. The level of compatibility between the market and justice can vary depending on prevailing contextual factors. Nevertheless, engaging the shared institutional characteristics of both can support market-based approaches to achieve climate justice [34]. In part, this means that policymakers implementing market-based approaches to addressing the issue of climate change (such as the banning or limiting of air-freighted fresh produce) must ensure that their climate change policies take into account the rights of vulnerable communities within their supply chains, the risks to them vis-à-vis emissions reduction policies and the responsibilities owed them [37].

The interplay between rights, risks, and responsibilities makes for an effective framework for crafting and shaping equitable climate change policies so that they attain climate justice, ensuring the upholding of rights and responsibilities while addressing and mitigating risks, especially for marginalized and vulnerable communities. When these elements are balanced, it helps to make certain that the impact of market-based approaches toward addressing climate change is positive by ensuring that vulnerable individuals and communities receive equitable treatment, protection, and economic opportunity.

References

1. Wu, P.; Yang, C. Sustainable development in aviation logistics: Successful drivers and business strategies. Bus. Strat. Environ. 2021, 30, 3763–3771.
2. Akram, H.W.; Akhtar, S.; Ahmad, A.; Anwar, I.; Sulaiman, M.A.B.A. Developing a Conceptual Framework Model for Effective Perishable Food Cold-Supply-Chain Management Based on Structured Literature Review. Sustainability 2023, 15, 4907.
3. Gov.uk. Transport and Environment Statistics 2022; Department of Transport, UK Government: London, UK, 2022. Available online: https://www.gov.uk/government/statistics/transport-and-environment-statistics-2022/transport-and-environment-statistics-2022#:~:text=In%202019%2C%20International%20Aviation%20emissions,in%20emissions%20in%20one%20yea (accessed on 3 October 2023).
4. Fathi, B.M.; Ansari, A.; Ansari, A. Green Commercial Aviation Supply Chain—A European Path to Environmental Sustainability. Sustainability 2023, 15, 6574.
5. Bagdi, Z.; Csámer, L.; Bakó, G. The green light for air transport: Sustainable aviation at present. Cogn. Sustain. 2023, 2.

6. Callister, P.; McLachlan, R.I. Managing Aotearoa New Zealand's greenhouse gas emissions from aviation. J. R. Soc. N. Z. 2023, 1–21.
7. Lee, D.S.; Fahey, D.W.; Skowron, A.; Allen, M.R.; Burkhardt, U.; Chen, Q.; Doherty, S.J.; Freeman, S.; Forster, P.M.; Fuglestvedt, J.; et al. The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. Atmos. Environ. 2021, 244, 117834.
8. SCM. Lidl Phases Out Air Freight for Fresh Produce; SCM: Doetinchem, The Netherlands, 2022; Available online: https://www.supplychainmovement.com/lidl-phases-out-air-freight-for-fresh-produce/ (accessed on 28 August 2023).
9. Capoccitti, S.; Khare, A.; Mildenberger, U. Aviation Industry—Mitigating Climate Change Impacts through Technology and Policy. J. Technol. Manag. Innov. 2010, 5, 66–75.
10. Ritchie, H. Climate Change and Flying: What Share of Global CO2 Emissions Come from Aviation? Our World in Data. 2020. Available online: https://ourworldindata.org/co2-emissions-from-aviation (accessed on 28 August 2023).
11. IEA.org. Tracking Aviation; International Energy Agency: Paris, France, 2023; Available online: https://www.iea.org/energy-system/transport/aviation#tracking (accessed on 28 August 2023).
12. European Commission. European Green Deal: New Law Agreed to Cut Aviation Emissions by Promoting Sustainable Aviation Fuels; European Commission: Brussels, Belgium, 2023; Available online: https://ec.europa.eu/commission/presscorner/detail/en/ip_23_2389 (accessed on 28 August 2023).
13. Ricardo. Advanced Fuels Fund. Ricardo.com. 2023. Available online: https://www.ricardo.com/en/news-and-insights/campaigns/aff (accessed on 28 August 2023).
14. Ritchie, H.; Roser, M. Emissions by Sector. Our World in Data. 2020. Available online: https://ourworldindata.org/emissions-by-sector (accessed on 28 August 2023).
15. Sim, S.; Barry, M.; Clift, R.; Cowell, S.J. The relative importance of transport in determining an appropriate sustainability strategy for food sourcing. Int. J. Life Cycle Assess. 2007, 12, 422–431.
16. Njoya, E.T.; Forsyth, P.; Niemeier, H.-M.; Nikitas, A. Examining the impact of air cargo growth on poor Vietnamese rural and urban households. Transp. Econ. Manag. 2023, 1, 112–125.
17. Kharaishvili, E.; Gechbaia, B.; Erkomaishvili, G.; Lobzhanidze, M.; Natsvlishvili, I. Shipping policy of agri-food products and the formation of food markets in Georgia. In Proceedings of the International Conference on Sustainable Transport System and Maritime Logistics (ISTSML 2021), Batumi, Georgia, 24 June 2021.
18. Hofenk, D.; van Birgelen, M.; Bloemer, J.; Semeijn, J. 'How and When Retailers' Sustainability Efforts Translate into Positive Consumer Responses: The Interplay Between Personal and Social Factors. J. Bus. Ethics 2019, 156, 473–492.
19. BRC. The UK Retail Industry and Climate Change. BRC.org.uk. n.d. Available online: https://brc.org.uk/climate-roadmap/section-1-context/15-the-uk-retail-industry-and-climate-change/ (accessed on 28 August 2023).
20. BRC. Retailers Are Making Strides in Cutting Carbon Emissions. BRC.org.uk. 2019. Available online: https://brc.org.uk/news/2019/2019-aug-02-carbon-data (accessed on 28 August 2023).

21. Marteau, T.M.; Chater, N.; Garnett, E.E. Changing behaviour for net zero 2050. BMJ 2021, 375, n2293.
22. Catalán-Gil, J.; Sánchez, D.; Llopis, R.; Nebot-Andrés, L.; Cabello, R. Energy Evaluation of Multiple Stage Commercial Refrigeration Architectures Adapted to F-Gas Regulation. Energies 2018, 11, 1915.
23. Sales, M. The Air Logistics Handbook: Air Freight and the Global Supply Chain; Routhledge: Devon, CA, USA, 2013.
24. Georgiadis, P. Air Freight Costs Soar to Record High. Financial Times. 2021. Available online: https://www.ft.com/content/15b44fc9-5f86-4b28-ae05-a3233db13977 (accessed on 27 August 2023).
25. Faruk, A.C.; Lamming, R.C.; Cousins, P.D.; Bowen, F.E. Analyzing, Mapping, and Managing Environmental Impacts along Supply Chains. J. Ind. Ecol. 2001, 5, 13–36.
26. Manuj, I.; Mentzer, J.T. Global supply chain risk management strategies. Int. J. Phys. Distrib. Logist. Manag. 2008, 38, 192–223.
27. Azizsafaei, M.; Hosseinian-Far, A.; Khandan, R.; Sarwar, D.; Daneshkhah, A. Assessing Risks in Dairy Supply Chain Systems: A System Dynamics Approach. Systems 2022, 10, 114.
28. Chenarides, L.; Manfredo, M.; Richards, T.J. COVID-19 and Food Supply Chains. Appl. Econ. Perspect. Policy 2021, 43, 270–279.
29. Deconinck, K.; Avery, E.; Jackson, L.A. Food Supply Chains and COVID-19: Impacts and Policy Lessons. Eurochoices 2020, 19, 34–39.
30. E-Fatima, K.; Khandan, R.; Hosseinian-Far, A.; Sarwar, D.; Ahmed, H.F. Adoption and Influence of Robotic Process Automation in Beef Supply Chains. Logistics 2022, 6, 48.
31. E-Fatima, K.; Khandan, R.; Hosseinian-Far, A.; Sarwar, D. The Adoption of Robotic Process Automation Considering Financial Aspects in Beef Supply Chains: An Approach towards Sustainability. Sustainability 2023, 15, 7236.
32. Nicola, S.; Fontana, E. Chapter 9—Fresh-Cut Produce Quality: Implications for a Systems Approach. In Postharvest Handling, 3rd ed.; Academic Press: Cambridge, MA, USA, 2014; pp. 217–273.
33. Yilmaz, N.; Atmanli, A. Sustainable alternative fuels in aviation. Energy 2017, 140, 1378–1386.
34. Sultana, F. Critical climate justice. Geogr. J. 2022, 188, 118–124.
35. Vanderheiden, S. Atmospheric Justice: A Political Theory of Climate Change Get access Arrow; Oxford University Press: Oxford, UK, 2008; p. 14.
36. Shrivastava, M.K.; Bhaduri, S. Market-based mechanism and ‘climate justice’: Reframing the debate for a way forward. Int. Environ. Agreem. Politics Law Econ. 2019, 19, 497–513.
37. Shaw, C. The role of rights, risks and responsibilities in the climate justice debate. Int. J. Clim. Chang. Strat. Manag. 2016, 8, 505–519.