Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Risks, resilience, and pathways to sustainable aviation: A COVID-19 perspective

Stefan Gössling

Keywords: COVID-19, Climate change, Resilience, Risk, State aid, Vulnerability

ABSTRACT

This paper discusses the COVID-19 pandemic as an opportunity to reconsider the foundations of the global aviation system. There is much evidence that air transport creates opportunities as well as risks. While the former accrue to businesses and individuals, risks are imposed on society. Pandemics, in which aviation has a role as a vector of pathogen distribution, as well as the sector’s contribution to climate change are examples of long-standing negative externalities that continue to be ignored in assessments of aviation’s economic performance and societal importance. As commercial aviation has shown limited economic resilience throughout its history, this short paper questions whether a return to business-as-usual, supported by very significant State aid payments, is desirable. The volume growth model championed by industry and aviation proponents may have to be replaced with an alternative model of a slimmed air transport system that is economically less vulnerable and accounting for its environmental impacts.

1. Introduction

Within two years, the world has moved from debates of overtourism to discussions of measures to relaunch a global fleet of largely grounded aircraft. Air transport, in April and May 2020, was down to 10–15% of corresponding 2019 levels (IATA, 2020). This unprecedented decline has affected all elements of the air transport value chain: aircraft manufacturers, airlines, airports, as well as associated sectors such as food services and retail. International tourism, which relies on air transport for 58% of arrivals, has come to a stand-still, with very significant negative consequences for tourism-dependent businesses and employment levels. To stabilize failing entities in the air transport value chain, billions of US$ have been allocated to airlines and airports (T&E, Greenpeace & Carbon Market Watch, 2020), with hopes to expediently return to business-as-usual (ICAO, 2020).

Yet, the crisis is a reminder of long-standing, interrelated and unresolved problems characterizing the global air transport system. For example, aviation’s growing contribution to climate change (IPCC et al., 1999; Fahey and Lee, 2016), the sector’s small and often negative profit margins (Doganis, 2005; Gössling and Higham, 2020; IATA, 2019a,b), as well as its continued and recurring dependence on State aid (Doganis, 2005; Gössling et al., 2017) are issues that have for a long time deserved greater political scrutiny. Global air transport also increases risks, such as the spread of pathogens on global scales, within very short timeframes (Browne, St-Onge Ahmad, Beck & Nguyen-Van-Tam, 2016). With ubiquitous policy calls to see the COVID-19 pandemic as an opportunity to rethink transport systems (e.g., ITF-OECD, 2020; Roland Berger, 2020; UNESCAP, 2020), this paper is intended as a contribution to the discussion of risks imposed by aviation. As the air transport sector has already received very significant subsidies, debate is needed how economic vulnerabilities can be reduced and environmental sustainability be increased.

2. Aviation is not only a victim

Many media statements released by airlines and industry organizations have suggested that aviation is a victim of the ongoing COVID-19 pandemic, and that restarting the sector has key relevance for global tourism and trade (ICAO, 2020). However, air transport has created its own vulnerabilities, because it is a vector in the spread of pathogens and diseases on various scales. This is true from the scale of individual cases of airport malaria (Wieters et al., 2019) to the global spread of Human Immunodeficiency Virus (HV; Flahault and Valleron, 1992), and epidemics including SARS or MERS (Gardner et al., 2016; Ruan et al., 2016). With
Air transport also increases person-to-person transmission risks of respiratory pathogens as a result of high crowd densities in enclosed spaces (Browne et al., 2016), i.e. airports and aircraft act as incubators and nodes of disease distribution. This is of relevance because any spread of disease, particularly at global scales, is associated with a cost (e.g. Rosen et al., 2004) that includes prevention, research, treatment, foregone business opportunities, and recession (e.g. Lee and McKibbin, 2004).

An associated risk is climate change, to which aviation makes a significant contribution. Globally, emissions from aviation approached one Gigaton (Gt) of carbon dioxide (CO$_2$) per year before the pandemic (IEA, 2019). The sector’s contribution to global warming is even significantly higher due to changes in radiative forcing caused by short-lived emissions at flight altitude (IPCC et al., 1999). Fahey and Lee (2016) estimate that aviation contributes close to 5% of all forcing from anthropogenic sources, i.e. significantly more than the warming from CO$_2$ alone (about 2.5%; IEA, 2019).

With expectations of continued growth and pre-COVID-19 industry projections that the global fleet of aircraft will double between 2018 and 2040 (Boeing, 2019), the importance of aviation as a contributor to climate change in an otherwise decarbonizing world will grow (Peeters et al., 2016).

Yet, even though these risks are well-documented, the general response has been to either ignore (pathogen/disease) or downplay (climate change) these challenges. Clearly, pathogen distribution is a cost of transportation and should be part of cost-benefit analyses, specifically as air industry lobby organizations regularly highlight “induced benefits” of aviation (AviationBenefits, 2020). To date, no global assessments of the cost of aviation-related pathogen distribution have been published. Climate change is another aspect that has essentially been ignored over the period 1997 to 2016, i.e. the year of the adoption of the Kyoto Protocol that assigned responsibility for reducing emissions (Browne et al., 2016), i.e. airports and aircraft act as incubators and nodes of disease distribution.

Climate change is another aspect that has essentially been ignored over the period 1997 to 2016, i.e. the year of the adoption of the Kyoto Protocol that assigned responsibility for reducing emissions (Browne et al., 2016), i.e. airports and aircraft act as incubators and nodes of disease distribution.

Climate change is another aspect that has essentially been ignored over the period 1997 to 2016, i.e. the year of the adoption of the Kyoto Protocol that assigned responsibility for reducing emissions (Browne et al., 2016), i.e. airports and aircraft act as incubators and nodes of disease distribution.

Climate change is another aspect that has essentially been ignored over the period 1997 to 2016, i.e. the year of the adoption of the Kyoto Protocol that assigned responsibility for reducing emissions (Browne et al., 2016), i.e. airports and aircraft act as incubators and nodes of disease distribution.
past, including the global financial crisis in 2008, have shown that there is a potential for quick rebounds. IATA (2020) expects that the recovery after COVID-19 will take longer, but a return to business-as-usual is expected nevertheless. Is this desirable from an integrated socio-environmental-economic viewpoint? The evidence is that a) aviation is responsible for very significant negative externalities imposed on society; b) demand is to a considerable degree induced, on the basis of very low fares; and c) the air transport system continues to focus on volume-growth strategies with small profit margins. The future vulnerabilities this implies should be obvious.

As consultants to industry and governments affirm (McKinsey & Company, 2020), COVID-19 has many similarities to climate change. The risk of global warming is systemic, nonstationary, nonlinear, requiring a focus on longer-term resilience, and characterized by market failure. It may be added that in contrast to COVID-19, climate change risks accumulate over time, are permanent, and will be very disruptive and irreversible when reaching tipping points (IPCC, 2018; Lenton et al., 2019). Contrary to COVID-19, climate change risks are well described in recurrent documents, the IPCC reports, available since the 1990s. There is also a principal global consensus, the Paris Agreement, on decarbonization, as a common goal for humanity (UNFCCC, 2019).

Against this background, it is of interest to consider the implications of plans to extend State aid to the air transport value chain. Aircraft manufacturers, airlines and airports have already received considerable and often unconditional support. The Airline Bailout Tracker published by T&E, Greenpeace and Carbon Market Watch (2020) suggests that in Europe, agreed bailouts now total €12.9 billion, with another €17.1 billion under discussion. In the USA, US$25 billion in loans and US$25 billion in grants have been made available to passenger airlines; US$8 billion to cargo carriers; and US$3 billion to airport contractors (Reuters, 2020a). Up to US$13 billion are accessible by Singapore Airlines (Reuters, 2020b). At the end of May 2020, the total volume of State aid may have exceeded US$100 billion, i.e. almost half of what global airlines reported as their net result over nine years, i.e. for the entire period 2010–2018 (US$196.9 billion; IATA, 2019). In other words, State aid now extended to airlines to ensure their survival is equivalent to the profits that may be made over many years, notably in the absence of further disruptions, and without considering the cost of negative externalities.

5. Thinking the unthinkable

As proposed by Banister and Hickman (2013), it is important to “think the unthinkable”, i.e. to consider longer-term transportation scenarios that embrace possibility, plausibility and desirability. It may be argued that air transport futures have been discussed mostly in terms of “possibility”, and less in terms of plausibility or desirability. “Possibilities” are framed economically, and by a limited number of actors, the proponents of volume growth. There is a notable absence of any discussion of alternative pathways. Yet, most stakeholders in industry and policymakers would agree that it is desirable for aviation to become more resilient financially and more sustainable climatically. It would seem that for this to happen, very radical changes are necessary in terms of measuring economic performance, the progress and potential of technology change, and the limits to sustainable transitions implied by a rapidly growing transport system (Gossling and Higham, 2020).

In conclusion, this discussion has revealed unsurmountable conflicts inherent in the proposition of continued volume growth and a reduction in risks and vulnerabilities. Hence, a reorientation is necessary that includes the possibility of a shrinking of the global air transport system to increase its desirability for society. It is also plausible. COVID-19 has forced many airlines to reduce their fleets, retire old aircraft, or stop serving long-haul destinations. Airlines have gone bankrupt (Flybee, South African Airways, Eurowings), or entered Voluntary Administration (Air Mauritius, Virgin Australia) (TTRWeekly, 2020). As a result, air transport capacity is diminished. Further reductions in capacity may be achieved by reducing subsidies. This should affect low-cost carriers such as Ryanair, an airline sometimes offering transport at a price below the cost of fuel, while counting among the European Union’s top 10 greenhouse gas emitters (The Guardian, 2019).

A scenario for a resilient aviation system should have a starting point in the question of how much air transport is needed; here, the COVID-19 pandemic leaves much room for critical reflection. A desirable aviation system is also one where risks are accounted for, and where their cost is part of the price paid for air travel. In a situation of reduced supply, there should be an opportunity for airlines to increase profitability. COVID-19 thus offers an opportunity to rethink global air transport. Many questions, such as those addressing volume growth, the sector’s reliance on State aid, its unresolved environmental impacts, and hence the basic assumptions on which aviation operates, will be difficult to ask. However, risks and vulnerabilities have to be weighed against short-term benefits, if the sector’s future resilience is to improve. If there is one lesson to be learned from the COVID-19 crisis, it is the demonstration that nation states can take radical structural actions to deal with emergencies.

Author statement

The idea for this opinion piece was developed by the author, who also wrote the entire text.

References

AviationBenefits, 2020. Adding value to the economy. Available: https://aviationbenefits.org/economic-growth/adding-value-to-the-economy/. (Accessed 26 May 2020).
Banister, D., 2018. Inequality in Transport. Alexandrine Press, Oxfordshire.
Banister, D., Hickman, R., 2013. Transport futures: thinking the unthinkable. Transport Pol. 29, 283–293.
Bock, L., Burkhardt, U., 2019. Contrail cirrus radiative forcing for future air traffic. Atmos. Chem. Phys. 19, 8163–8174.
Boeing, 2019. Commercial Market Outlook 2019-2038: Available: https://www.boeing.com/commercial/markets/commercial-market-outlook/. (Accessed 8 March 2020).
Browne, A., St-Georges Ahmad, S., Beck, C.R., Nguyen-Van-Tam, J.S., 2016. The roles of transportation and transportation hubs in the propagation of influenza and coronaviruses: a systematic review. J. Trav. Med. 23 (1), tav002.
Doganis, R., 2005. The Airline Business, second ed. Routledge, London.
Fahey, D.W., Lee, D.S., 2016. Aviation and climate change: a scientific perspective. Carbon Clim. Law Rev. 2016 (2), 97–104.
Flahault, A., Valleron, A.J., 1992. A method for assessing the global spread of HIV-1 infection based on air travel. Math. Popul. Stud. 3 (3), 161–171.
Gardner, L.M., Chughtai, A.A., MacIntyre, C.R., 2016. Risk of global spread of Middle East respiratory syndrome coronavirus (MERS-CoV) via the air transport network. J. Trav. Med. 23 (6), tav107.
Gossling, S., 2019. Celebrities, air travel, and social norms. Ann. Tourism Res. 79 https://doi.org/10.1016/j.janannals.2019.102775.
Gossling, S., Nilsson, J.H., 2011. Frequent flyer programmes and the reproduction of mobility. Environ. Plann. 43, 241–252.
Gossling, S., Fichert, F., Forsyth., P., 2017. Subsidies in aviation. Sustainability 9 (8), 1295.
Gossling, S., Hanna, P., Higham, J., Cohen, S., Hopkins, D., 2019. Can we fly less? Evaluating the ‘necessity’ of air travel. J. Air Transp. Manag. 81 https://doi.org/10.1016/j.jairtraman.2019.101722.
Gossling, S., Higham, J., 2020. The low carbon imperative: destination management under urgent climate change. J. Trav. Res. https://doi.org/10.1177/0047287520933679.
Hanna, P., Kantenhacker, J., Cohen, S., Gossling, S., 2018. Role model advocacy for sustainable transport. Transp. Res. Part D 61, 373–382. https://doi.org/10.1016/j.trd.2017.07.028.
IATA, 2009. Fact Sheet: Industry Statistics. https://www.iata.org/pressroom/Documents/FASt%20Sheet%20Industry%20Facts%20%20Sep%2009.pdf, (Accessed 26 May 2020).
IATA, 2017. Economic Performance of the Airline Industry. https://www.iata.org/w khtml2a/Documents/economics/Central-forecast-mid-year-2017-tables.pdf. (Accessed 26 May 2020).
IATA, 2019a. Industry Facts. https://www.iata.org/wkhtml2a/Documents/economics/Central-forecast-mid-year-2019-tables.pdf. (Accessed 26 May 2020).
IATA, 2019b. Air Transport Statistics 2019. https://www.iata.org/contentassets/a8686f62455045d3e58e0f8b37f0b26/wats-2019-mediatkit.pdf. (Accessed 26 May 2020).
IATA, 2019c. Economic Performance of the Airline Industry. https://www.iata.org/e n/iata-repository/publications/economic-reports/airline-industry-economic-per formance—december-2019—report/. (Accessed 26 May 2020).
IATA, 2020. May Passenger Demand Shows Slight Improvement. IATA. https://www.iata.org/en/pressroom/pr/2020-07-01-02/.
