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How to make low-carbon academia fly? Reducing academic air travel beyond COVID-19

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Abstract

This article seeks to advance our understanding of the underlying reasons that sustain high levels of academic flying, and explores how a low carbon academia with less academic air travel might come about. Data from thirty interviews with academics showed that internationalization, networking, improving research, and ideals of a productive academic stand amongst the strongest drivers of academic flying. These drivers come forth from underlying objectives such as pursuing excellence in research and working towards productive and successful careers. Findings from this research suggests that institutional and cultural change are prerequisites to mainstream the practical alternatives to academic flying that are at hand, such as wider use of digital communication tools, alternative modes of transport, and low-carbon conferences and meetings. We see a role for universities, grant-providing authorities and other academic organisations to include environmental standards and criteria in internationalization strategies, the concept of excellence, and funding evaluation processes. From our analysis of academics' experiences during the COVID-19 pandemic we identify three factors that appear essential in determining whether digital communication tools can substitute physical presence; (1) the type of interaction that is desired, (2) the type of social relations that are existing among participants, and (3) the number of people who participate. Reporting on these factors can point out in which cases flying can be substituted by digital communication. Finally, we discuss whether and to which extent voluntary guidelines, the adoption of digital tools, and other soft measures will lead to cuts in academic flying at the scale and pace required for meeting climate targets, suggesting that strict limits on academic air travel might be unavoidable.

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1. Introduction

Transport emissions accounted for over 24 percent of global CO₂ emissions in 2019 and are expected to grow at a faster rate than any other sector, posing a major challenge to efforts to reduce emissions in line with the Paris Agreement (IEA, 2020). The aviation industry represents a significant contributor to climate change. In 2018, the industry caused 2,4 percent of global anthropogenic CO₂ emissions (Lee et al., 2021). When including aviation's impact through altering cloud formations, producing contrails, and emitting other greenhouse gasses such as NO_x, the industry accounted for 3,5 percent of all human induced changes in the earth's energy balance (Lee et al., 2021).

Although aviation's share of global emissions appears relatively small, flying is often at the spotlight of climate debates for at least three reasons. First, at least until the start of the COVID-19 pandemic, the aviation industry was expected to grow dramatically in the coming decades. Prior to the COVID-19 pandemic, ICAO (2020) forecasted jet fuel consumption to increase by 2.1 to 3.1 times in 2045, compared to 2015 levels. Second, technological solutions do not seem able to facilitate low carbon flying, at least in the short term. The aviation industry is increasingly investing in new technologies, such as electric flying, hydrogen and alternative fuels like biofuels and synthetic kerosene. But such solutions are not able to deliver reductions at the time scale that is required, and thus passenger demand must be addressed (Macintosh & Wallace, 2009; Murphy et al., 2018). Furthermore, Peeters et al. (2016) argue that policy makers' belief in technology as the solution for sustainable aviation has contributed to avoid or delay policies aimed at reducing growth in the volume of air transport.

Finally, an essential feature of aviation is that its benefits and harms are highly unequally distributed, both within society and among generations, offering a show case example of climate injustice in mobility patterns. Gössling & Humpe (2020) estimate that only two to four percent of the global population boarded an airplane in 2018, and only one percent of the global population emits 50 percent of CO₂ emissions from commercial aviation. At the same time, the external environmental costs of flying are hardly reflected in the price of a ticket; kerosene is largely exempted from taxation, in many countries flight tickets are exempted from VAT, and related GHG emissions are hardly priced (CE Delft, 2019). As such, the more affluent get to benefit from cheap tickets and shift the environmental cost of flying to the poorer part of the population and to future generations.

Until recently, the general expectation was that aviation emissions would continue to expand unrestricted through any foreseeable future. Two recent developments, however, have brought new prospects on flying practices. First, awareness of the climate impacts of flying is growing in some parts of the world. *Flight Shame*, which stands for 'an unease about the climate implications of air travel, and bears evidence of a change in social norms that have so far associated flying with social status', quickly became a widespread phenomenon (Gössling et al., 2020:1). In Sweden this translated into a four percent decline in international flying and a nine percent decline in domestic flying in 2019 (Swedavia, 2020). Such changes do not stop at the Swedish boarder. Gössling et al. (2020) link

debates about so-called *flight shame* with negative growth rates in domestic aviation in Germany. Gössling et al. state that, according to these changing norms around aviation, ‘air travel is no longer seen as inconsequential for climate change’ (2020:9). Climate activist Greta Tunberg’s sailing journey crossing the Atlantic in 2019 symbolizes this change of awareness in rich countries, and has perhaps amplified this sense of awareness. While policies are so far failing to reduce air travel demand, changing social norms can.

Second, the COVID-19 pandemic has severely affected air travelling demand worldwide. In 2020, the aviation sector carried 60 percent fewer passengers than the year before (ICAO, 2021). The pandemic is expected to affect flying not only immediately by means of enforced mobility restrictions, but also in an enduring way, due to the boost it has triggered in digital communication technologies, and associated changes in the working environment and culture (Suau-Sanchez et al., 2020).

Academics represent a particularly interesting group when studying flying practices. The internationalization of academia has turned flying into a routinized and normalized component of academic life, leading to carbon footprints well above average, also among ecologists (Fox et al., 2009; Strengers, 2014). The described rise in awareness about the climate impact of flying and the altering norms that come with it have also reached academia (Sangova & Morozova, 2020). The carbon footprint of academics is increasingly scrutinized, with special attention to flying aspects of academic life (Higham & Font, 2020). At the same time many academics, research groups, universities, and other academic institutions have initiated proposals to reduce academic flying (see for example, <https://academicflyingblog.wordpress.com/> and <https://www.carbonneutraluniversity.org>). Although pre-COVID-19 debates on academic flying led to some low-carbon academia initiatives, the pandemic unexpectedly forced the academic community into an unprecedented large-scale low carbon academia experiment. In the coming years we will learn to what extent the renewed academic habits and rhythms will stick.

The ongoing urgency to respond to climate change, as well as the experiences with different academic practises and new technologies in 2020 are likely to have an enduring impact on academic mobility practices. For individuals, universities, research associations and other academic organisations wanting to reduce academia’s climate impact, it is crucial to better understand the various drivers of academic flying. Experiences with digital communication tools during the pandemic might provide valuable insights for reducing the carbon footprint of academia. As such, this research aims to explore how academic flying might be reduced. The following three research questions together are central in this study:

- A. What are the main drivers of academic flying practices?
- B. What is the potential of digital communication tools in reducing academic flying beyond the duration of the pandemic? In which contexts can they substitute flying, and in which can they not?

C. How could academic practices, institutions, and their enabling factors be organized differently and enduringly, in such a way that involves less academic flying?

To answer these questions, the Norwegian University of Life Sciences (NMBU) serves as a case study. Qualitative interviews with NMBU's academic staff form the empirical basis of this research.

2. Background

2.1 The New Mobilities Paradigm and aeromobilities

The New Mobilities Paradigm (NMP) analyses the movement of people, objects, technology, images and information (Sheller & Urry, 2006). The framework is useful for the purposes of this research because it includes the linkages between different types of mobility. Adopting the NMP's comprehensive scope can be advantageous because various mobilities are interlinked and co-shape each other. The acceleration in the adoption of digital communication tools as a result of COVID-19 induced traveling restrictions is only one example of such linkages. According to Sheller & Urry (2006), practices as flying, traveling by train, and videoconferencing should thus not be examined in isolation, but their interdependencies should be taken into account.

The NMP framework provides relevant conceptual tools for analysing why traveling occurs, because it emphasises the social basis of traveling. Following Castells (1996), Urry (2003) emphasizes the role of traveling and movement in the 'networked society', a society in which moments of co-presence are central. Either co-presence to a face (being at one place with one or more persons), place (being at a certain place) or moment (being at a certain event), which can be experienced as obligatory, desired, appropriate, or a mix (Urry, 2003). For example, some cases of work-related travel can be obligatory, while traveling to attend a wedding abroad might be desired, appropriate and socially obligatory. Face-to-face interactions in particular seem essential in nearly any network or social relation because they allow for eye contact, facial expressions, body language and touch. Eye contact in particular is regarded as an intimate trait of physical co-presence as 'one cannot take through the eye, without at the same time giving' (Frisby & Featherstone, 2000:112). Such traits of physical co-presence facilitate trust, essential for establishing relations and networks.

Aeromobilities represents a sub-category within the broader field of mobilities research. On the one hand aeromobilities covers the practice of flying itself, but it also includes the practices into which flying is an incorporated practice, such as holiday making, visiting friends and relatives, or working (Randles & Mander, 2009). In addition, the physical and institutional structures that reproduce the practice of flying are also included in the concept (Randles & Mander, 2009). These include airports and booking systems, but also economic policy affecting flying (e.g. taxes or subsidies on flying industry). If we are interested in how academic flying might be reduced, we need to understand the drivers and contexts that drive and allow academic flying to occur. Furthermore, if

we are interested in assessing to what extent digital communication tools might substitute specific academic activities, we need to understand why and in what contexts physical co-presence has sufficient added value, and when it might be less needed. These insights can help envisioning a way to work towards a low-carbon academia that involves less flying.

2.2 Why do academics fly?

Following Grant (2018), academic flying is defined here as air travel by academics for purposes of attending meetings and conferences, carrying out field work, and engaging in other professional activities. In recent years a body of literature has emerged with scholars who question, analyse and research practices of academic flying. Researchers from various disciplines such as anthropology (Baer, 2019) ethnomusicology (Grant, 2018), ecology (Burke, 2010; Fox et al., 2009), sustainable transport (Caset et al., 2018), computer science (Eriksson et al., 2020), tourism (Higham & Font, 2020) and geography (Nevins, 2014) have analysed academic flying practices within their own disciplines. A clear commonality that derives from these studies is that flying is strongly embedded within academia. Academics experience this embeddedness of flying within academia through expectations and obligations from transnational academic networks (Storme et al., 2017).

Furthermore, academic flying is seen as an important facet of an academic career and even linked to success (Urry, 2012). Having international networks, being part of international collaborations, and publishing for an international audience are perceived as highly prized academic assets and even as prerequisites for academic promotion and tenure (Caset et al., 2018; Strengers, 2014)

Presenting work and learning from colleagues at research conferences is seen as important, but academics regard the networking opportunities at conferences as even more important (Baer, 2019; Hopkins et al., 2019; Urry, 2016). Informal moments are regarded as essential for maintaining and expanding academic networks. What makes such informal moments particularly valuable is that they represent face-to-face interactions. Such interactions allow for richer and more complex communication, and signal meanings of respect and value (Storme et al., 2017; Strengers, 2015).

External expectations regarding the internationalisation of academic careers, perceived linkage to success, and the importance of face-to-face interactions represent major drivers of academic flying, but there are also more personal dynamics at play. Traveling is often seen as stimulating, enriching and enabling new experiences (Gustafson, 2006). Høyer & Næss (2001) identify the positive connotations of academic traveling as well, and coined the term ‘conference tourism’. Visiting conferences allows for a break from routines and offers a chance to meet new people and experience new places. Besides such positive connotations there are downsides as well. Some academics perceive their mobility practices as stressful and tiring, and as a threat to spending time with family (Hopkins et al., 2019).

2.3 Climate impacts of academic flying

The climate impact of academic flying is increasingly scrutinized, not least by academics themselves. Caset et al. (2018) refer to it as ‘the elephant in the room’, while Baer (2019) speaks of ‘the elephant in the sky’. The climate impact of various aspects of academia have been widely analysed, ranging from conferences, PhD projects to scientific papers (Achten et al., 2013; Bousema et al., 2020; Burke, 2010; Spinellis & Louridas, 2013). Various trends and patterns emerge.

Work-related flying represents a significant part of academics’ carbon footprint. Roughly 70,3 percent of the carbon footprint of a 4-year PhD in environmental sciences in Leuven (Belgium) resulted from flying (Achten et al., 2013). This finding is in line with conclusions from Fox et al. (2009), a group of conservation scientists, who estimate their flying practices to cover roughly 2/3 of their carbon footprint.

When looking at large international conferences, long haul flights cause the majority of emissions. For example, at the Royal Geographical Society’s 2006 annual international conference, only a minority of the delegates took a long haul flight (16,7%), but these long haul flights represented 87,3 percent of the travelling kilometres attributed to the conference (Hall, 2007). Desiere (2016) finds a similar pattern in the context of a European conference for agricultural economists; only ten percent of the participants accounted for 50 percent of the conference’s travel emissions.

Academics are not a homogenous group when it comes to academic flying; significant variations exist along positions and geographical locations. Generally, the higher the position, the more an academic travels by plane (Arsenault et al., 2019; Ciers et al., 2019; Wynes et al., 2019). In addition, there is variation based on geographic location. Conference attending economists from regions other than Europe and North America travel most (Chalvatzis & Ormosi, 2020). This is mostly because most conferences take place in North America and Europe. It is understandable that Australian academics for example, see flying as important for their careers, as they must fly to meet other academics in Europe and North-America (Glover et al., 2019). On the contrary, academics employed at universities in the global South face very different contexts, because often the funds to attend conferences in the global North are lacking. As academic flying practices are highly career-stage and location specific, possible ways forward are likely to be equally different.

2.4 Practical alternatives

Various practical alternatives are available to reduce academic flying, spanning from digital communication tools and a transport mode shift, to alternative ways of organising conferences.

Adopting digital communication tools such as videoconferencing has been suggested as a means to reduce academic flying, also prior to the COVID-19 pandemic (Burke, 2010; Calliari et al., 2020; Eriksson et al., 2020; Fraser et al., 2017). Videoconferencing is not carbon neutral (Obringer et al., 2021; Ong et al., 2014) but has significant potential to reduce the carbon footprint of academic activities (Achten et al., 2013; Bousema et al., 2020). However, Storme et al. (2017) observe that, in

practice, videoconferencing often functions as an additional virtual mobility to a pre-existing corporeal mobility and can have rebound effects. For example, videoconferencing allows people to maintain connected to a distant network, which might lead to more academic flying to meet collaborators from those networks. It is also argued that videoconferencing cannot fully substitute all face-to-face meetings because it does not allow for the same interactions (Higham et al. (2019)). Opposing pre-COVID-19 observations, Schwarz et al. (2020) argue that the experiences during the pandemic show that digital formats actually can substitute many physical interactions in academia. In theory, videoconferencing can thus both increase and reduce academic flying.

Because a significant share of academic air travelling emissions comes from long haul flights, it seems that alternative transport modes can only reduce academic flying to some extent. Ciers et al. (2019) estimate that the École Polytechnique Fédérale de Lausanne (Switzerland) could reduce its emissions from academic flying by up to 15 percent by switching to alternative modes of transport. Data from a European conference in Slovenia suggests that shifting to public transport has the potential to reduce the conference's travelling emissions by 13 percent (Desiere, 2016). Promoting a transport mode shift can reduce a small share of academic flying for European academic institutions and academics. For scholars and institutions in regions with less well connected rail networks there might be much less potential.

Because conferences account for a significant share of academic flying, it is worth to examine different ways of organizing conferences that imply lower levels academic flying (Nurse-Bray et al., 2019). A seemingly straight-forward way to reduce the carbon footprint of academia is organizing fewer conferences (Philippe, 2008). Annual conferences for example, could be held biannually, possibly with virtual conferences in the alternating years (Hall, 2007; Klöwer et al., 2020). Choosing meeting- and conference locations based on the lowest total travel emissions can be another way to reduce emissions (Stroud & Feeley, 2015). Ponette-Gonzalez & Byrnes (2011) estimate that optimizing the location of a US national conference can reduce travel emissions by 6 to 30 percent. In addition, instead of having a conference at one physical place, using multiple decentralized locations might have even more potential for reducing emissions (Bousema et al., 2020; Ponette-González & Byrnes, 2011). Decentralized conferences allow international colleagues from the same region to meet in person, while keynotes and other video content can be shared among different locations. A future conference model might combine various aspects that have been mentioned above. A hybrid decentralized conference model, also called a hub-model, that connects one or several geographically optimal conference locations with several virtual participants, is likely to have a severe reduction potential (Fraser et al., 2017; Klöwer et al., 2020).

3. Materials and Methods

Case study

The Norwegian University of Life Sciences (NMBU) was used as a case study. The international character and environmental focus of NMBU make the university a particularly interesting case to study academic air travel. NMBU is a relatively small university, located in southern Norway. It has a strong focus on food, health, environmental protection, climate and sustainable use of natural resources. In its International Action Plan, NMBU (2020) states that in order to contribute to reaching the Sustainable Development Goals, ‘extensive international collaboration is a prerequisite to succeed’(p2). In 2020, 12 percent of bachelor students, 56 percent of master students, 50 percent of PhD candidates, and 8 percent of staff had a foreign nationality (NMBU, 2020). Furthermore, the university participates in approximately 170 international research collaboration agreements. 59,9 percent of co-authored publications including NMBU staff, were the result of international collaboration. Such numbers illustrate the extensive international dimension that characterises academia in general, and NMBU in particular.

NMBU’s international focus does not appear out of a vacuum. It is co-shaped by broader Norwegian and European institutional contexts. In its long term research and education strategy for 2015-2024, the Norwegian Ministry of Education and Research (2014) is devoted to stimulate long-term international collaboration. The Ministry sees international cooperation ‘as a prerequisite for carrying out top world research’ (p43). The Norwegian government emphasizes the importance of opportunities such as the EU’s Horizon 2020 research fund. Clearly, NMBU’s international goals, ambitions and focus are embedded in a wider institutional framework.

Methods

Thirty semi-structured interviews were conducted in January and February 2021 among NMBU’s academic staff. The interviews included questions whereby participants were asked to describe the frequency, purposes, and destinations of their academic flying practices before and during the COVID-19 pandemic. Participants were also requested to share their experiences with digital communication tools and asked whether they thought efforts should be made to reduce academic flying, and if so, where this change should come from, and what concrete actions would be needed.

Participants were selected by using quota sampling to ensure a good representation of the various faculties and academic positions (Lune & Berg, 2017). Using a random letter generator, we started at a random place in the employee-list and approached staff through email. Because the focus of this research is on academic flying, we only contacted academic staff, excluding administrative and other non-academic staff. We kept approaching staff until we had at least one PhD candidate, one associate professor and one professor from each of the seven faculties (see appendix 1). We worked with at least three participants from each faculty to give all faculties a voice and hence reduce possible disciplinary biases in travel patterns and opinions. We approached a total of 214

academics, which makes a response rate of 14 percent. Although we did not sample on gender, the sample has a decent gender balance, with 17 female and 13 male participants. At the time the interviews were conducted, various traveling restrictions were in place because of the COVID-19 pandemic. All interviews were conducted through videocalls, and lasted between 25 and 50 minutes each.

After the participants agreed and signed a consent form following the university’s ethical clearance policy, all interviews were recorded and transcribed using transcription software. We adopted an inductive thematic approach to the coding and analysis. In thematic coding, an index of themes and subthemes is constructed after a thorough reading of the interview transcripts (Bryman, 2012). We for example categorized the emerging drivers of academic flying by their related specific- and broader objectives (table 1). In addition, this study strongly builds on secondary data sources. In Google Scholar we found relevant articles by searching for terms such as ‘academic flying’, ‘academic air travel’ and ‘academic aeromobility’. Lastly, to better understand the institutional context in which academics at NMBU are working we assessed policy- and strategy documents from the university and other relevant authorities.

4. Results

4.1 Drivers of academic flying

Table 1 outlines the various drivers of academic flying that are present among academics at NMBU. In the paragraphs below we provide more details on the findings in the table.

Table 1. Drivers of academic flying at NMBU

Broader objective	Specific objective	Driver of flying	Influence on flying
Pursuing research excellence and career success	Internationalisation	• An academic CV with international collaborations and activities increases chances of receiving funding	+
		• Research projects that include collaborators from multiple countries are more likely to get funding from grant-providing authorities	+
		• Requirements for hiring and promotions	+
	Networking	• Establishing an academic network	+
		• Maintaining relationships	+
	Improved research	• Sharing knowledge and keeping up to date on the latest state of the art research at conferences and project meetings	+

		<ul style="list-style-type: none"> To be in one room/place with academics from the same research field, which brings input, inspiration and ideas for teaching and research 	+
	Productivity	<ul style="list-style-type: none"> Overall lack of time and a high workload (which does not allow for slower means of transport) NMBU provides extra funding for traveling when staff is publishing more. (funds for traveling serve as an incentive to publish) PhD candidates working in a specialized field that NMBU does not have expertise on, requiring candidates to take courses at other universities (often abroad) 	+
Work-life balance and personal well-being	Personal context	<ul style="list-style-type: none"> The joy of traveling and going to conferences Academics who are further in their career often see traveling as a burden 	+ -
Ethics	Environmental concerns / norms	<ul style="list-style-type: none"> Increased concern about the environment Feeling pressure from colleagues to fly less because of the environment 	- -
Economic objectives	Cost efficiency	<ul style="list-style-type: none"> Flying is a relatively cheap way of travelling 	+

Internationalisation objectives within NMBU, grant-providing authorities and overall research policy are identified as strong drivers of academic flying. Specific criteria from grant-providing authorities such as the Norwegian Research Council and the European Research Council were perceived by participants to result in more flying. In the first place, for individual researchers it is strongly beneficial to have a track record of international talks and collaborations. As such, academics are encouraged to undertake international activities (e.g. invited talks and conferences) in order to be eligible for grants. Secondly, in the case of applications for collaborative projects, grant-providing authorities prioritize projects with members from multiple countries and universities. This emphasis on international cooperation is not surprising as it is just the manifestation of strategic objectives from NMBU and the Norwegian Ministry of Education and Research (2014) that see international cooperation ‘as a prerequisite for carrying out top world research’ (p43). Various academics pointed out that in some cases the push for internationalization has gone too far.

A crucial aspect of an academic career is building up and maintaining networks. Research conferences are typically seen as arenas that facilitate academics to build up and maintain their networks. One PhD student declared that ‘*Supervisors and professors in general are always stressing about building a network*’ (interview 17). To build up their networks, PhD candidates are encouraged to attend research conferences, to do research stays abroad and take courses at other institutions.

Especially informal occasions during coffee-, lunch- and dinner breaks typically facilitate the establishment and maintenance of academic networks. Both PhD students and more senior academics stressed that young academics have a great need to travel in order to build up their networks. Senior academics travel to maintain their networks.

For various reasons, participants state that flying enables them to improve their research. To increase the quality of research it is important to share knowledge with colleagues and to keep up to date on the latest progressions. Engaging with new knowledge and interacting with colleagues appears to be a valuable source of input, inspirations and new ideas. Bringing a group of academics with shared interests at one particular place leads to highly beneficial dynamics, that seems to enrich and improve the quality of research. Lastly, flying allows academics to study distant parts of the world and to use specialized equipment such as laboratories.

Notions of a high-speed academia with strong incentives to maximize the number of publications were present among the participants. This focus on productivity is linked to academic flying. First, maximizing the amount of publications often translates into higher numbers of conference- and project meeting attendances. Second, high workloads indirectly relate to high levels of flying, as they reduce opportunities for taking more time consuming means of travelling such as the train. Various academics appreciate travelling by train because they perceive it as a more relaxed way of travelling, because it allows to get work done while being on the move, and also because of the environmental benefits. At the same time, time constraints and conflicts with high workloads came forward. Academics aiming to maximize their publication rates might find themselves on the one hand as having less time to take alternative modes of transport for shorter distances, while at the same time wanting to and perhaps needing to attend an increasing amount of research conferences and project meetings. Clearly, the culture that idealises the productive academic seems to contribute to high levels of academic flying.

Besides drivers related to the pursuit of excellence in research or building up successful academic careers, there are also personal drivers at play. Especially for younger academics, travelling itself, the joy of attending conferences and seeing and experiencing new places are drivers of academic flying. In this case, not only face-to-face types of co-presence are driving the practice of academic flying, but also face-to-place and face-to-the-moment types of co-presence (Urry, 2003). On the contrary, academics who are further in their career often see traveling as a burden and as being unpleasant and stressful, or as an activity that reduces time spent with family. Accordingly, many professors expressed relief at not having to travel so much during the pandemic.

Several participants stated to aim to reduce their academic flying for environmental reasons. Among many participants feelings of guilt and discomfort were expressed. Several academics at NMBU are more selective when considering whether to fly or not. In several cases environmental concerns were felt at a personal level, but academics were also often influenced by concerns among relatives or colleagues.

Lastly, because flying is often the cheapest means of travelling, it is preferred over more expensive modes of transport. Individual academics and collaborative research projects operate within limited budgets, which often lead to a prioritization of air travel.

4.2 Factors determining whether digital tools can substitute physical presence

Nearly without exception, all respondents stated that a lot of the planned activities during the pandemic were either postponed, cancelled, or held digital instead. Academics at NMBU have greatly differing experiences with using digital tools, but when being asked what they think they will do when travelling restrictions are over, nearly all say they think it will be a mix of digital communication tools and travelling. To assess the potential of digital communication tools in substituting physical presence, we need to get a better understanding of *what* works, and *what* does not work. Three factors appear to be highly important in determining whether digital communication tools can substitute physical presence; (1) the type of interaction that is desired, (2) the type of social relations that are existing among participants, and (3) the number of people who participate.

Type of interaction

Digital tools cannot deliver the full extent of interaction that physical presence allows for. Digital tools seem to be less able to facilitate the more informal type of interactions. These informal moments are perceived as important because they are essential for building up and maintaining professional relations, discussing science and developing new ideas. The words ‘coffee break’, ‘bar’, ‘lunch break’ and ‘diner’ were mentioned many times by respondents as important social moments at research conferences and meetings. Respondents state that this informal part of conferences is at least equally important as the formal part (the actual presentations and seminars). Such informal moments appear to be very hard, if not impossible, to replicate in a digital setting. It seems to be that the scheduled and planned nature of digital events and meetings do not allow so much for unexpected moments. As one participant puts it: ‘*You don’t bump into somebody at a conference on Zoom*’ (interviewee 27). On the other hand, when informal types of interaction are less needed, the planned and structured nature of digital communication appears to be very efficient.

But also beyond research conferences, for example when setting up a project plan, it can be highly beneficial to meet in person. Academics find it challenging to do creative work in a digital setting. On the contrary, updating project-members on progress and sharing results can be easily done online. This seems logical, because when sharing results, only one person needs to talk at the same time, the type of interaction is very different.

Type of social relations

The type of social relations between participants represents a second important contextual factor that codetermines whether digital communication tools might be sufficient in replacing physical co-

presence. Overall it seems that digital communication tools are relatively less suited for interactions between people who have not met in person. Academics find it difficult to make new connections and meet new people in the digital world. As we saw earlier, this is strongly related to the type of interactions and dynamics that digital communication tools allow for. But also, beginning collaborative work with a new group of people on a digital platform is challenging for many. The keyword here is trust. When there is no trust relationship established yet, academics find it challenging to work together through a digital platform. But when a trust relationship is already present, for example through moments of physical co-presence in the past, online collaborative work becomes much more of an option. Following from this, it seems that the first meeting in a new collaborative project benefits much more from being held physically, than potential follow up meetings.

Number of people

A third contextual factor is the number of people that are to participate. In various occasions, meetings with larger groups seem more difficult to function well digitally. The interactions within a larger group of people might be too complex to accommodate for on a digital platform. When meeting in person with a large group, the breaks become important, the informal moments, the quick chat with the person you are sitting next to, the energy you feel in the room. Although break-out rooms can be useful, overall, the bigger the group, the less people seem able to actively participate in a digital meeting. In some occasions digital tools can work well with large groups, for example to broadcast a talk where no lively interaction is desired. As this example shows, the three contextual factors shouldn't be examined in isolation, but instead in sum and in relation to each other.

4.3 How can academic flying be reduced?

Nearly all participants expressed that in their opinion academic flying should be reduced. But what can academics and academic institutions *do* to reduce academic flying? Respondents state that change should not just come from the individual, or just from institutions such as universities or grant-providing authorities, but that a combined effort is required, and that all these actors play a role to some extent. But when being asked how reductions might come about, several issues and potential trade-offs came to the surface.

The role of universities

Most of the interviewed academics see a role for NMBU in reducing academic flying, but the level of interference they see for NMBU varies widely. Relatively lower levels of interference such as awareness creation through information campaigns were brought forward. Guidelines that help academics in assessing whether flying is necessary or not for a particular trip were mentioned several

times as well. But when the level of inference by the university increases, for example through more strict regulations, some challenges and problems emerge.

One such issue is that the contexts of different academics and academic projects are often very different. A researcher who studies certain rock formations in southern Norway with mostly Scandinavian collaborators might for example have very different traveling 'needs' when compared to an academic who is specialized in tropical marine ecology and works with international colleagues on projects in Indonesia and Brazil. Of course, guidelines could take such differences into account, but it would be very difficult to cover all the complexities that are present. Even when taking such complexities into account, academics point out that it is still very difficult to create guidelines that point out whether – in a particular situation - travelling is *useful* or not, and whether it is *necessary* or not. Many argue that in the end, only the researcher can make this judgement. Another respondent suggested to make academics justify each trip to their dean. Academics would remain the freedom to travel when, where and how often they want, but would be forced to think about it and report to their dean why they think their flight is necessary.

Perhaps the highest level of interference from NMBU would be present if the administration would decide to implement strict rules, for example through an individual carbon quota related to travelling. On this issue strongly differing position came forward in the interviews. Just as with guidelines, the complexities were pointed out by some as highly challenging to encompass in a carbon quota. In addition, various participants argued that the level of interference from NMBU should not have an impact on academic freedom. Strong opposition was present among some academics against such measures. At the same time, others would welcome or even argue for more strict rules, but added that they expect opposition from other academics. As such the apparent reluctance against strict university rules might not come as a surprise.

The role of grant-providing authorities

Because grant-providing authorities have a lot of power by deciding what projects get funding, they might be able to help create the institutional backing needed to overcome the embeddedness of flying within academia. Some participants point out they already have to provide information on the carbon footprint of their projects when applying for funding through certain organisations. It seems that some grant-providing authorities already took a first step, by at least making academics think through the carbon footprints of their proposed projects. But it seems that there is not much weight being put on such criteria. Respondents pointed out that giving more weight to climate criteria might oppose other objectives and criteria such as internationalization and the overall objective of pursuing excellence in research.

5. Discussion

The discussion is structured along four subsections. First, we outline that the practical alternatives which have been discussed earlier will only come about alongside cultural and institutional change. Second, we point at the subjectiveness of the distinction between necessary and superfluous academic air travel. Third we propose that strict regulatory limits seem to be needed because voluntary guidelines might not lead to sufficient emission reductions. We also engage with possible implications for academic freedom and the pursuit of excellence in research. Finally, we examine the potential synergies between low carbon- and slow scholarship.

5.1 Institutional and cultural change

Practical alternatives such as digital communication tools, alternative modes of transport and new conference models are available, but there are clear counteracting structural forces at play that drive air travel in academia. As academic flying is linked to academic excellence, perceptions of successful productive careers, enabling professional networks and internationalization, it seems to be challenging to abstain from it. As such, as came forward in the interviews of this study, academics argue that change cannot be just expected from individual academics, but universities and other organisations must make steps as well. Nursey-Bray et al. (2019) argue that academics need support to get over their ‘fear of not flying’. Change is needed from universities, research groups, academic societies, but also from grant-providing authorities (Strengers, 2014). This support can range in levels of interference, from information campaigns, voluntary guidelines and facilitating digital communication options, to alternative funding priorities and strict regulatory limits.

In line with Strengers (2014), this research shows that internationalisation represents one strong institutional driver of academic flying. We have seen that NMBU and grant-providing authorities have strong ambitions regarding the internationalization of research. Individual scholars find themselves in an environment in which they are stimulated to build up international careers and interact globally. This is by no means unique, and not new either. Centuries ago, European universities were already internationally oriented (Geuna, 1998). Nevertheless, in recent decades the availability of well-connected airports and cheaper tickets have facilitated a rise of internationalisation within academia. Internationalisation is increasingly seen as a prerequisite for carrying out excellent or ‘world class’ research (Wihlborg & Robson, 2018). Economic, equality, and reputation related rationales are present as well (Willis & Taylor, 2014). Statements from participants in this research resonate with Ackers’ (2008) observations that internationalization and ideals of a mobile academic sometimes have gone too far and have become an end in itself. So far, academic institutions seem to push unconditionally for internationalisation. The related costs in the form of climate impacts do not seem to be seriously considered. Following Glover (2018), universities and other academic institutions that are serious about reducing their climate impact, must reassess their internationalization strategies and include climate impacts in their considerations.

Besides institutional change, a change in academic culture itself is required as well in order to significantly reduce levels of academic flying (Janisch & Hilty, 2017). Because flying has become culturally embedded in the academic system, it is necessary to transform air travel from ‘being a routine, frequent, normal part of academic life, to something less routine, less frequent and less normal.’ (Glover et al., 2018:766). Already, some signs of cultural change are emerging; several individual academics have pledged to strongly reduce or even eliminate academic flying (Tyers, 2019). Some universities, for example in Canada and the UK, are adopting emission reduction policies (Concordia University, 2019; Hoolohan et al., 2021) and several other ‘low-carbon academia’ related initiatives are popping up. Such early movers might pave the way for the acceptance of higher level, and more enforced institutional changes. We might also expect that the COVID-19 pandemic will bring a cultural shift within academia regarding norms and expectations about physical presence at meetings and conferences, given the gained experience and skills around digital communication tools.

5.2 ‘Necessary’ and superfluous flying

Almost everyone will agree that superfluous academic flying should be reduced. But what we should consider as necessary and what as superfluous flying is a much more difficult question. As Gössling et al. (2019) state, the necessity of flying is perceived very differently among individuals, and thus we cannot generalize it. Glover et al. (2019) for example show that most Australian academics perceive air travel is a necessity, enforced by geographical location. Necessity is thus strongly subjective, and is ultimately about context and setting priorities, either prioritizing physical presence for a certain objective, or prioritizing not to fly (for example for personal, budgetary or environmental reasons). For instance, if not going to a certain conference would mean missing out on the opportunity to further establish a professional network, some academics might consider it as necessary to fly, while others would not. But whether a flight is considered necessary does not only depend on the related objectives, the (environmental) costs and perceived social norms also play a role (Gössling et al., 2019). In the end, setting priorities is a balancing act. Moral concern might lead a certain academic to choose to not fly, despite missing out on reaching certain objectives. As we have seen, several academics at NMBU state to perform this balancing act on their own initiative. At the institutional level, such considerations seem to be much less present. There is a need to continue and intensify ongoing dialogues and discussions within academia to redefine whether the objectives of a flight are *worth it*, in relation to the climate impact that comes with it.

The pandemic has shown that what we consider as necessary academic flying can change. The consequences of not flying for certain academic trips might not have been acceptable first, but are acceptable now. Not having physical presence in a certain project meeting might have been unthinkable first, but could be the new norm in a post-pandemic world. Whether digital communication tools can make a certain flight unnecessary strongly depends on a few contextual

factors. The type of interaction that is required, the type of social relations that are present, and the number of participants that are to participate are some crucial factors that determine whether digital communication tools might make physical presence unnecessary. These factors might prove useful as a tool to assess whether any specific academic flight can be substituted by digital communication tools. Universities and grant-providing authorities could demand academics to report on these factors when applying for travelling funding. The three factors could be used as an extension to already existing decision trees and other academic travel policy documents (see for example Cimburova et al., 2021; Tyndall Centre, 2015).

5.3 Limits, academic freedom and excellence

Demanding from academics to justify their academic flying might lead to cut some or perhaps all superfluous flying. But whether this would lead to acceptable emission levels remains questionable. If we would ignore historical emissions from academics, and adopt the global emission reduction pathway for a 1,5 degree world, as advised by the IPCC (2018), emissions from academic flying must be reduced by 50 percent in 2030. Most likely more is needed than only cutting academic flights that are considered superfluous by academics themselves. Voluntary guidelines and information campaigns might not be enough. Especially when counteracting forces such as the institutional push for internationalization remain at current levels. But as we have seen in this study, the level of interference that academic organisations should induce on academics is a complicated and somewhat heated topic.

Strict limits such as individual carbon quota for academics have been suggested before (Erikson, 2020). Also in this study, some respondents argued for strict regulatory limits, while others strongly opposed. Opponents of regulatory limits on academic flying point at trade-offs that limits might bring, such as with academic freedom. The culture around academic freedom and autonomy is strongly prevalent, not least at NMBU. Academics, and senior academics in particular, have great freedom in how they spend their budgets. Universities that strive to establish conditions for a low-carbon academia, might need to take away some autonomy of their academic staff. The variety and complexity with regards to ‘traveling needs’ among disciplines and academic careers should be taken into account as much as possible. But even when limits would account for some degree of complexity, they are still likely to come with limitations on internationalization and academic freedom.

Strict limits might also challenge the unlimited pursuit of excellence in research. At the hearts of NMBU and the Norwegian research council lies the objective to achieve excellence in research at state of the art international standards (Forskningradet, 2021; NMBU, 2020). Similar to previous studies, several participants believe that excellence in research and notions of a successful academic are not compatible with a low-carbon type of academia (Glover et al., 2019; Strengers, 2014). Contrary to these more qualitative studies, a quantitative research by Wynes et al. (2019), showed that there is no link between the amount of flights taken and the academic performance measured in

number of citations. The findings suggest that academics may be able to reduce their academic flying without having to fear significant career sacrifices. Perhaps the consequences for excellence in research as a result of limits on academic flying might be less severe than many academics would expect.

Another approach is to include environmental indicators within the concept of excellence. There are ongoing discussions on what excellence in research should mean and how it should be measured (Ferretti et al., 2018). Reforms are already happening. Certain institutions now include the health of research groups and societal impacts of the research in the assessment of what is considered excellent research (Nature, 2018). Perhaps the environmental impacts of research should be included as well. Participants in this study state that certain Norwegian grant-providing authorities already demand information on environmental and ethical issues in applications, but the importance that is given to them seems unknown. Since grant-providing authorities are powerful actors, they might be able to contribute significantly to make a low-carbon academia come about, by giving more weight to the environmental impact of research projects when distributing funding.

5.4 Speed, equity and the productive academic

Ideals of a productive academic are widely experienced in academia, and are another important driver of academic flying. Numbers matter in academia, be it the number of publications or the number of citations, more is better is the norm in this so called publication culture (Tijdink et al., 2016). But the high pace of academia is not without consequences. The high speed and time scarcity within academia have been criticized because of the negative impact on the well-being of academics (Davies & Bansel, 2005). Mountz et al. (2015) add that the *'fast paced, metric-oriented neoliberal university'* (p1236) might have negative impacts on the quality of research. Hartman & Darab (2012) conclude that slow-scholarship is needed. We can add that a slower academia might also help enable a low carbon type of academia. Indeed, there might be synergies between slow scholarship and low carbon academia. A slower academia in which time is less scarce might allow for slower, low carbon means of transport for shorter journeys. Academics who, supported by institutional and cultural change, publish and engage in research conferences and research collaborations less frequently, but with more time and energy, might lower their academic carbon footprints significantly.

Finally, slow scholarship can also contribute to a more equitable academia. High speed travelling such as air travel is only accessible for a small minority (Gössling & Humpe, 2020). As Illich (1974) noted early on, if left unregulated, high speed transportation modes are forces that undermine equity. While in theory, the system of aeromobility might have been able to connect marginalized scholars in the global South with the academic centres in Europe and North America, in practice it is has possibly even increased the gap. The dominance of North America and Europe within academia in terms of funding opportunities, journals, language and scientific discourses has been widely documented and is increasingly scrutinized (Collyer, 2018; Trahar et al., 2019).

Aeromobility allows academics with sufficient funding and resources to lead the hypermobile careers they live. Nevins (2014) concludes that academics who get to fly regularly exercise ecological privilege. Implementing regulatory limits on those academics who fly frequently might also take away some of the ecological privilege that Nevins refers to. Shelley-Egan (2020) adds that a new academic *modus operandi*, in which digital tools play a larger role, makes academia more accessible for academics with fewer resources. In a low-carbon academia with less academic flying, more digital communication and perhaps more localized collaborations, academics who were first unable to take part, might now be able to participate.

5.5 limitations

The findings of this study come with a few limitations. Given the low response rate (14%), the sample could be biased towards participants with a high interest in the topic of this study and towards participants who are particularly concerned about the climate. This could mean that the opinions of respondents with highest pro-environmental values and attitudes are overrepresented in the sample. In addition, academics with more tight schedules might be underrepresented because they would not have time to participate. Also, because all interviews were conducted through videocall, the sample might underrepresent those academics with a strong aversion against digital communication tools. At last, our interpretations and discussion could be influenced by the fact that we are studying our own university.

The institutional drivers of academic flying that came forward in this research need further investigation. A better understanding of policies and strategies at universities and grant-providing authorities, and national and European research policy is needed. Further research could for example investigate the project evaluation processes at grant-providing authorities. Such research could include perspectives from key informants such as policy makers and administrative staff at such institutions. Finally, this research focused specifically on academics and academic institutions, and their sphere of influence towards change. Wider economic and infrastructural policy have been mostly left out of the analysis, but we acknowledge their importance in reducing academic flying.

6. Conclusion

This article has sought to analyse how academic flying can be reduced. Our key findings indicate that internationalization, networking, improving research, and ideals of a productive academic represent strong drivers of flying in academia. These drivers come forth from underlying objectives such as pursuing excellence in research and working towards productive and successful careers. Such dynamics are in turn strongly culturally and institutionally embedded, for example in university policies and strategies as well as in assessment criteria of grant-providing authorities, but also in national policy documents. Hence, if more sustainable alternatives such as digital communication tools, alternative modes of transport and low-carbon conferences and meetings are to be mobilized,

change cannot be left to individual choices alone; the institutional structures that shape and constraint existing patterns of choice must be changed too. Examples of such changes are a reassessment of internationalisation strategies and the inclusion of environmental impact criteria within funding evaluation guidelines.

The unplanned experiences with digital communication tools during the pandemic might prove useful to make institutional and cultural changes come about, as they have demonstrated the superfluous nature of some academic travelling. To lower levels of academic flying enduringly, a deeper understanding is needed of when physical presence provides high added value, and when digital communications tools might be a good substitute. Three factors together codetermine whether physical presence has sufficient added value over digital communication tools in certain situation, and include the type of interaction, the type of social relations and the number of participants. Digital communication tools work best when a low level of interaction is required, when participants already know each other, and when the number of participants is low. This matter needs further (quantitative) investigation, but might be useful already for academics and academic organisations that want to increase the use of digital communication. Crucially, a better understanding is also needed of academic perceptions of the added value of physical presence in relation to various occasions and objectives.

Given the significance of the emission reduction targets that are required, it is questionable whether voluntary guidelines and other soft measures will lead to sufficient cuts in academic flying. Harder rules such as limits on academic air travel through the establishment of carbon caps might be unavoidable to reduce emissions in line with Paris agreement targets. Caps could include a degree of flexibility to account for different individual academic realities. Nevertheless, such limits won't be uncontroversial, as academics point at possible conflicts and trade-offs with other ideals and objectives, such as internationalization, academic freedom, and the overall pursuit of excellence in research. But limits to academic flying would also challenge the status quo in academia, with the privileged position of a lucky few who are used to their hypermobile careers. Putting limits on academic flying might thus take away some of this privilege. At the same time, more frequent use of digital communication tools can make academia more accessible to those in geographical areas further away from the academic core and to those who do not have the resources to travel.

Setting limits on academic flying and redefining the purpose of academia need active participation from and discussions among academics. It seems unlikely that serious attempts to cut academic travelling emissions will come about without resistance towards change. This will be the case especially in academic cultures where the autonomy of individual researchers is given strong importance. Nevertheless such structural changes seem necessary if levels of academic flying are to be cut to levels in accordance with international targets.

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Appendix 1: distribution of sample along position and faculty

	Landscape and Society	Veterinary Medicine	Environmental Sciences and Natural Resource Management	Chemistry, Biotechnology and Food Sciences	Biosciences	School of Economics and Business	Science and Technology	Total
PhD	1	1	2	1	1	3	1	10
Associate Professor	1	1	1	2	1	2	1	9
Professor	2	1	2	1	2	1	2	11
Total	4	3	5	4	4	6	4	30

Appendix 2: Interview guide

RQ	related questions
A. What are the main drivers of academic flying practices?	1-4,10-16
B. What is the potential of digital communication tools in reducing academic flying beyond the duration of the pandemic? In which contexts can they substitute flying, and in which can they not?	5-9
C. How could academic practices, institutions, and their enabling factors be organized differently and enduringly, in such a way that involves less academic flying?	17-20

A Academic flying practices

1. For how many years have you been working in academia?
2. How would you describe your own academic flying in terms of frequency, purposes and destinations?
3. Can you give an estimation of how many national and how many international flights you made annually over the last 5 years? Counting a return flight as 1.
4. Have your academic mobility practices changed over time? How?

B The impact of COVID-19 on academic flying practices

5. If you compare your academic flying before and after the start of the pandemic, what has changed? Did any of your planned trips get cancelled?
6. How is COVID-19 impacting your academic flying?
7. What are your experiences with digital conferencing? Advantages, disadvantages?
8. In which contexts would you choose for digital conferencing? In which contexts would you choose to travel?
9. Do you think your mobility practices will change after the pandemic? (given the boost experienced in digital alternatives and the normalization of their use)

C Latest academic trips

10. When was your last academic trip within Norway outside of the region Ås-Oslo?
 1. Where?
 2. How did you travel?
 3. How long did you stay?

4. What purpose? Other side purposes? (e.g. other academic events during the trip, visiting the area)
5. What considerations did you make when choosing your way of travelling?
6. Did you consider a different mode of transport?
7. Did you consider digital alternatives?

11. When was your last academic trip abroad?

1. Where?
2. How did you travel?
3. How long did you stay?
4. What purpose? Other side purposes? (e.g. other academic events during the trip, visiting the area)
5. What considerations did you make when choosing your way of travelling?
6. Did you consider a different mode of transport?
7. Did you consider digital alternatives?

D Considerations, motivations and external dynamics that lead to flying

12. Do you consider flying as important for your academic career? In which way?
13. What are your considerations when you book a work related flight?
14. Have they changed in the last five years?
15. Do you experience expectations regarding your academic flying from colleagues, staff members or other academics in your field of expertise? Both in a positive and a negative way. Do they influence your academic flying? How?

E Perspectives on efforts to reduce academic flying

16. What do you personally think about academic flying in relation to climate change?
17. Do you think academia should make an effort to reduce academic flying from its staff?
18. If yes, who should change come from?
19. If yes, what should be done?
20. If academia would aim to reduce academic flying, what do you think is the potential of: videoconferencing? A transport mode shift? Having fewer conferences? Having more decentralized conferences? An individual carbon quota?

F Other

21. Do you have any other comments you'd like to make?



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