

OUT OF A CLEAR GREEN SKY

ONLINE DIALOGUES SURROUNDING COMMERCIAL PASSENGER
AIR TRAVEL & SUSTAINABILITY, POST-COVID



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A Major Research Project presented to OCAD University, in partial fulfillment of the requirements for the degree of Masters of Design in Strategic Foresight and Innovation.

Toronto, Ontario, Canada, August 2020

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ABSTRACT

Even as it deals with the fallout from COVID-19 travel restrictions, commercial passenger air travel finds itself approaching an even bigger challenge: that of its contribution to greenhouse gas emissions through its everyday operations, which also contribute to its increasing vulnerability. As a complex transportation infrastructure, air travel is key to many other systems around the world in economic, social, logistical, political, and cultural spaces, and its entrenchment in these systems is driven in part by our own expectations of air travel as being an available option. However, the COVID-19 travel bans have brought a huge shock to air travel, and also a rare opportunity in this very busy industry to pause and deeply reimagine what the future could be. Through an exploratory process of using strategic and ethnographic foresight, and analyzing the differences between how air travel is conceived both in formal and informal online discourses, key insights are generated as to the possible areas of leverage for getting the air travel industry to change faster, and also to help its passengers care more about sustainability.

ACKNOWLEDGEMENTS

This major research project would not have been possible without the support, great questions, and honest feedback from so many people, beginning with my incredible advisors, Suzanne Stein and Alexander ter Kuile. Suzanne, thank you so much for your laughter, amazing stories, wisdom, caring, and endless endless patience as I figured out how do a MRP the slow way! Alexander, thank you for your immediate enthusiasm, pragmatism, incredible expertise, and amazing Remarks – never would I have ever expected the nuts-and-bolts of internal air transport processes to be so engaging and fun to read! This project would not have made it off the ground without the immeasurable generosity, support, guidance, fun links, and commiseration from both of you – thank you so much for keeping me accountable and I'm so honoured that you both chose to spend some of your time on this project!

Secondly, thank you to my fellow SFI classmates for being great people to work with and learn from. Special thanks to Liin Nur, Patricia Wong, and Kathryn Cramer for your friendship and for being incredibly kind sounding boards, link-senders, thought-untanglers, and readers for this chunk of words!

Thirdly, thank you to my friends and family for your patience, understanding, for keeping me grounded, and making sure I was eating enough food during the writing of this project. Special thanks to Megan Scarth, my uncle Paul, and my mom Catherine, for all of your editing work and helping this paper in its journey towards cohesion. I love you all!

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This research was undertaken primarily in Tkaronto or Toronto, which is associated with the Dish With One Spoon Wampum treaty and is the unceded territory of many nations including the Mississaugas of the Credit, Chippewa, Anishnaabeg, Wendat, and Haudenosaunee peoples. It was also undertaken partially in Mi'kma'ki or Halifax, the ancestral and unceded territory of the Mi'kmaq People and associated with the Peace and Friendship treaties between the Mi'kmaq People and British Crown. It was finalized in the vicinity of Sault Ste. Marie, which is in the territory of the Anishnaabeg of the Garden River First Nation and associated with the Robinson-Huron Treaty.

It is important to keep in mind that the Indigenous people and nations of the world have known the land intimately, and have been at the forefront of thinking about and strategizing for climate change long before scientists became involved.

TABLE OF CONTENTS

<u>CREATIVE COMMONS COPYRIGHT NOTICE</u>	<u>II</u>
IN BRIEF, YOU ARE FREE TO:.....	II
<u>ABSTRACT</u>	<u>III</u>
<u>ACKNOWLEDGEMENTS</u>	<u>IV</u>
<u>LIST OF TABLES & FIGURES.....</u>	<u>VII</u>
<u>CHAPTER 1: INTRO</u>	<u>I</u>
<u>CHAPTER 2: CONTEXT</u>	<u>6</u>
2.1 WHY DO PEOPLE FLY?.....	6
2.1.1 WHY PEOPLE DON'T FLY	11
2.1.2 HOW & WHY AIRLINES TRACK WHY PEOPLE FLY	14
2.1.3 WHY DO WE CARE WHY PEOPLE FLY?	16
2.2 A SHORT SWOOP INTO THE AIR TRAVEL INDUSTRY	17
2.2.1 QUICK FACTS & MAJOR PLAYERS IN THE AIR TRAVEL ECOSYSTEM	17
2.2.2 THE IMPACT OF COVID-19	19
2.3 KEY PRINCIPLES OF SUSTAINABILITY	21
2.4 WAYS IN WHICH AIR TRAVEL IS TRYING TO GO MORE GREEN	24
2.4.1 AIRPLANE TECH IMPROVEMENTS.....	25
2.4.2 OTHER ADJACENT TECH & EXPERIENCE IMPROVEMENTS.....	26
2.4.3 SUPPORT FROM UP HIGH	27
2.4.4 WAYS THAT AIR TRAVEL IS NOT GOING GREEN	28
<u>CHAPTER 3: METHODOLOGY</u>	<u>31</u>
3.1 DATA GATHERING	31
3.2 ETHICS	33
3.3 BRINGING IT ALL TOGETHER: SWOT, VERGE, & CONCEPT FAN	35

CHAPTER 4: ANALYSIS.....	37
4.1 LITERATURE REVIEW	37
4.2 CONCEPTIONS THE AIR TRAVEL INDUSTRY HAS OF ITSELF	41
4.2.1 SOME COMMON THEMES.....	42
4.2.2 SWOT MATRIX.....	44
4.2.3 COMPETING FLIGHT PATHS FOR CLIMATE AND ECONOMICS.....	48
4.3 ANALYSIS OF NETNOGRAPHY	48
4.3.1 HOW PEOPLE ARE TALKING ABOUT THINGS, AND WHAT THIS MEANS FOR THE AIR TRAVEL INDUSTRY ...	54
CHAPTER 5: FINDINGS.....	57
5.1 VERGE FOR COVID-ERA TRAVEL.....	57
5.1.1 COVID: A BOLT FROM THE BLUE.....	58
5.1.2 THE VERGE WHEEL	59
5.1.3 SUSTAINABILITY ACCOUNTABILITY IS UP IN THE AIR	62
5.2 CONCEPT FANS	63
5.3 DISCUSSION	67
5.3.1 THE OPTICS OF ECONOMICS.....	68
5.3.2 CIVIL RIGHTS X CIVIL AVIATION.....	69
5.3.3 THE ROLE OF A KEEN PUBLIC IN SUSTAINABILITY.....	70
5.3.4 LEVERS TO INFLUENCE CHANGE	71
CHAPTER 6: CONCLUSION	76
6.1 SUMMARY OF THE PROJECT & CONCLUSIONS	76
6.2 CONTRIBUTIONS	80
6.3 AREAS OF FUTURE STUDY.....	81
BIBLIOGRAPHY	83
APPENDICES: VERGE & CONCEPT FANS.....	99
APPENDIX A	100
VERGE WALKTHROUGH	100

APPENDIX B	105
CONCEPT FAN #1 – REIMAGINING AIR TRAVEL FOR SUSTAINABILITY	105
APPENDIX C	108
CONCEPT FAN #2 – FOR FINDING SOLUTIONS TO CLIMATE APATHY POST-COVID	108
HELLO	110
APPENDIX D	111
GREYSCALE FRAMEWORKS	111

LIST OF TABLES & FIGURES

FIGURE 1: AN ANONYMOUS MEME POST ON INSTAGRAM HIGHLIGHTS HOW MUCH PEOPLE MISS AIRPLANE TRAVEL (MEMES, 2020).....	7
TABLE 1: SWOT ANALYSIS FOR AIR TRAVEL BEFORE COVID, ORGANIZED WITH INTERNAL STRENGTHS AND WEAKNESSES ON TOP AND EXTERNAL OPPORTUNITIES AND THREATS ON THE BOTTOM.....	46
FIGURE 2: SWOT ANALYSIS READING GUIDE	47
FIGURE 3: VERGE, FOR PEOPLE IN LOCKDOWN POST-COVID	60
FIGURE 4: CONCEPT FAN #1 - REIMAGINING AIR TRAVEL FOR SUSTAINABILITY	64
FIGURE 5: THE BACKWARDS SHIFT TO START A NEW CONCEPT FAN.....	65
FIGURE 6: CONCEPT FAN #2 - FOR FINDING SOLUTIONS TO CLIMATE APATHY POST-COVID.	66
FIGURE 7: VERGE WHEEL, LARGE-SIZE	104
FIGURE 8: CONCEPT FAN 1, LARGE-SIZE.....	107
FIGURE 9: CONCEPT FAN 2, LARGE-SIZE.....	110
FIGURE 10: VERGE WHEEL, LARGE-SIZE, IN GREYSCALE	112
FIGURE 11: CONCEPT FAN 1, LARGE-SIZE, IN GREYSCALE	113
FIGURE 12: CONCEPT FAN 2, LARGE-SIZE, IN GREYSCALE	114

CHAPTER 1: INTRO

On March 14, 2020, two days before France went into total lockdown to restrict the spread of COVID-19, I was crammed into a tiny seat three rows in front of the washrooms in the back of a flight from Paris to Toronto. My seatmate and I were swapping techniques to wrap our faces with the scarves we had brought as makeshift facemasks. One week before, en route to Paris, I was congratulated on my foresight by the security guard scanning my bag simply because I had brought an extra bottle of pocket-sized hand sanitizer. The difference that coronavirus prevention measures had made in a week were significant and telling: on the return flight home, as my seatmate and I bonded over our head wrappings and shared spritzes of sanitizer, we also shared snippets of what we overheard from the people around us. The couple two rows back had to rebook two flights to get onto this one before the borders closed in the USA, and the flight attendant, mask under chin, smiled and agreed that it was a “crazy time”. The guy sitting across the aisle and one row up was “definitely sick” and gleefully retold his friend how he had lied to the customs and gate agents about his health status in order to be allowed onto the plane, glad to have skirted a barrier that would have denied him his flight. The lady in the most middle of middle seats in our row settled in and defiantly declared to her traveling companion in French that there was ‘no way [she’d] miss [her] vacation’. The atmosphere on this flight was much more alert than any other flight I had been on before, with everyone suddenly hyper-aware of how everyone else in the vicinity was behaving. This sudden shift to hyper-awareness was noticeable because of its causes: firstly, that most people were suddenly cognizant of their individual responsibility for collective safety, and secondly, because of the abrupt presentation of the idea that travel might be inaccessible for more than a couple of weeks. The common theme of ‘abruptness’ is interesting as it illustrates the degree to which air travel in its pre-COVID state was considered ‘normal’, which also shows how much international air travel had been integrated into Global Northern social structures, and also the ease and protection from consequences that air travellers and aviation have enjoyed up until now. Although the sudden change caused a general feeling of worry along with the hyper-awareness, it was also a great conversation starter, in that my seatmates and I enjoyed thinking of what the add-on effects of COVID-19 could be. Breaking out of these mental models of what air travel has been expected to be uncovers some other opportunities to reimagine how to adapt air travel for the emergent future.

It is pretty evident, a few months into the COVID-19 pandemic, that one of the main reasons why the virus spread so quickly and thoroughly across the world was due to our great interconnectivity facilitated in part by air travel (Linac, 2020). Although the COVID-19 pandemic is understood to have not been caused by climate change-related effects, it is certainly true that the probability of another pandemic is rising, as animal habitat shrinks from climate change and human encroachment (Bernstein, 2020) and also as global warming thaws out old diseases like anthrax preserved in permafrost (Doucleff, 2016). This means that air travel has created a paradox for itself, in that what makes it valuable to the world also creates increasing probabilities for future diseases to become traumatic shocks to itself. In some ways this also means that the COVID-19 pandemic is a test for the air travel industry, in its ability to handle an emergent shock that quickly becomes globalized. There are also increasing probability of future shocks in relation to climate change itself, and the unpredictability of these future shocks means that air travel's reaction to COVID-19 should be indicative of both the industry and the people who use it.

As an international infrastructure, air travel is relied on for the successful functioning of many other human systems. However, taking a plane can be one of the biggest additions to a person's carbon footprint ("Climate Change," 2019) and the effects of the greenhouse gas emissions produced by airplanes alone contribute about 5% to global warming per year (Overton, 2019). Global warming creates global climate change, which is caused by the warming of the planet's atmosphere creating destabilization of global ecological processes enough so as to cause irrevocable planet-wide changes, some geological or climate-related processes that would directly and negatively affect air travel's functioning, and eventual uninhabitability for us humans. Faced with such a massive and complex challenge that presents a direct threat to our continued predictable lives, it is surprising that many recent human systems have not been urgently trying to mitigate or minimize climate change – instead, they seem to deprioritize ecological responsibility and don't often include ecological sustainability as a key output at all. However, the integration of infrastructure in human systems is due to its iteration over time to fit the needs of the people who use it, as well as those running the infrastructure operations. Over the past few hundred years, the main value measurement in the status quo has been financial, and ecological considerations have been deprioritized. With the current opportunity provided by the COVID-19 shock and the door to unexpected considerations broken open, there might be a chance to reevaluate human systems like air travel to become regenerative instead of destructive, and to increase its resilience to future shocks as well. Using commercial passenger aviation as a case study and with

the goal of spurring further research into other international infrastructures, the research question for this project is: how might we reimagine air travel for ecological sustainability, if at all?

In order to answer this question, it is useful to break it down into two component sub-parts. The first is the idea of “reimagining”: since air travel is a system invented for humans and by humans, allowing for a personal element in the reconstruction and adaptation of this system is key to its success. The second is the goal of “for ecological sustainability”: this requires a pragmatic, tangible approach, since the environment communicates with us through changes that are measurable or felt. Since the air travel industry is necessarily results-based as well, the pragmatic approach also relates to the industry side of the question. So, the research question is really about using the social discourse to inform how to adapt air travel for ecological sustainability or determining if it’s possible within climate parameters. Imagination is a mental ability and adaptation is change over time in the direction of a goal, so merging the two requires looking at mental models that people have of air travel and how sustainable it is, as well as conceptions and mental models that people who work in air travel hold for the industry as well as its sustainable practices.

I originally thought that reimagining Canadian aviation would be a good place to start. However, since global warming and the resulting climate change are both global phenomena, people use air travel for long distances, and since the international governing body called the International Civil Aviation Organization (ICAO) counts each country’s vote equally (ICAO Secretariat, 2014), I realized that considering the macro system as a whole and incorporating broad trends was important in determining any possible answers. Currently, wealthy countries in East Asia, North America, Europe and Australia have most of the world’s busiest air travel routes (*Busiest Routes 2020*, 2020). Also, pre-COVID air travel was generally growing faster than it could cap emissions, due to demand rising from the new middle classes in places with equally rising economies like China and India (Tabuchi, 2019). Paired with high-income countries contributing much more than their share of total global per-capita emissions (Ritchie, 2018b), the correlation makes it clear that the responsibilities of climate change mitigation in air travel lie mostly with wealthy people in wealthy countries and their affiliated companies.

This means that examining how to adapt air travel to sustainability is necessarily a project for the privileged; and the information available for this project reflects the globally privileged milieu it exists in. Alongside restrictions caused by English being the main language I could read sources in, this

means that this project intentionally looks at the broad, macro, global, and international system of air travel but with a moderate bias towards the wealthier and English-communicating Western world of the Global North in general. As my main interaction with air travel has been as a passenger, I used an exploratory philosophy to uncover structural aspects and hidden costs that I had been hitherto protected from by both my socioeconomic privilege as part of the approximately 20% of the world's population that has ever flown (Muilenberg in (Gurdus, 2017)), and also status as a client. Ironically enough, since the idea for this paper started when on my plane trips to visit family both to-and-from Halifax, Canada, and Paris, France, I was lucky enough to remember to journal on my plane ride back from Paris, where what was a "normal air travel" experience was just starting to shift to "abnormal" due to the COVID-19 shock. This paper follows a similar journey, since people who interact with air travel still think of it mostly in reference to their experiences pre-COVID, but the pandemic-related restrictions have caused a traumatic shock to the air travel industry with emerging after-effects. It is important to reiterate that, although this project doesn't touch on this very much, this distinction between "normal" and "abnormal" is also an experience that has been relatively globally restricted, and the new, more shrunken "normal" that the global air travel industry will find itself in post-COVID will seem odd to many of the more historically represented traveller and insider groups but "normal" to the emerging middle classes of the world who will gain access to air travel in the future.

In relation to insider knowledge and new knowledge, and coincidentally reflecting the two aspects of the research question between human-derived and results-based factors, there seemed to be a disconnect between the more formal perspective represented by airlines and industry governance, and the more informal social perceptions of long-distance travel from the travellers. I tried to incorporate both in the structure of this study to reimagine discourses between them and in relation to sustainability. Starting off with some context outlining air travel, how people fit into air travel, and sustainability activism, I use a literature review to analyze the more formal conceptions of what air travel is and a SWOT for a snapshot of its pre-COVID internal and external strengths and risks, since the specifics of how the air travel system will formally change post-COVID are just starting to emerge. To act as a foil, I then use a netnography review to analyze the more informal and online-community-based conceptions of how informal groupings of travellers think of air travel and integrate it into their lives, using COVID as an inflection point to observe change happening and then tracking them on a Verge wheel to illustrate their circular repetitive nature. Infusing both in a creative problem-solving attempt

using Concept Fans allowed for a pragmatic imagination space in order to break out of the established status quo and expectations surrounding air travel. Merging the sectoral and social discourses leads to demonstrating differences and common trends, which are then synthesized to generate person-centred possible solutions and also possible levers to (strongly) encourage the air travel industry and its already privileged lead and extreme users to become sustainable faster.

Although some new ideas and initiatives towards sustainability are discussed, aviation is in many ways a lynchpin for many other local, national, and international systems and this diversity of context means that aviation is particularly hard to pin down with effective accuracy. This means that this study is not focused on creating a detailed game plan for reimagining air travel to be ecologically sustainable, but should be taken as a contextual backgrounder in order to more accurately tackle the complexity of this challenge and allow for use in other massive international infrastructural industries as well.

Please fasten your seatbelts, make sure your seats are in the upright and locked position and your tray tables stowed, and have an interesting read!

CHAPTER 2: CONTEXT

2.1 WHY DO PEOPLE FLY?

In one of the most common questions asking someone to imagine their preferred superpower, the choice is often presented as between invisibility or flying. In the Marvel Cinematic Universe's Avengers series, four of the planet-protecting superhero team can fly or at least levitate, six others fly using devices specifically designed to allow them to do so, and one – Captain Marvel, one of the strongest Avengers – has both flight superpowers and is an Air Force pilot (Boden & Fleck, 2018). Being able to experience and explore the seemingly insubstantial air like birds has been a perennial preoccupation, and so being able to experience flight in an airplane can inspire fear, fun, and fascination. Across the world, the integration of air travel different regions has led to regional semiotics and symbolism of airplanes and air travel, and can demonstrate some of the reasons why people might want to fly even just for the experience of flying.

An example of the cultural reference that airplanes have is that flying can be related to the idea of freedom and mobility, and this linkage has been reinforced during the COVID-19-spawned border lockdowns and travel bans. This is shown through some representative examples, like Indi Samarajiva lamenting how much the American passport power has dropped by saying “[The USA] has crashed right through failed state and into a plague state, unwelcome across the world” (Samarajiva, 2020), and through internet memes such as this one with over 870 000 likes:



Figure 1: An anonymous meme post on Instagram highlights how much people miss airplane travel (Memes, 2020).

The idea of freedom and mobility means different things in different places: so for Europe, because they have such good train and road infrastructure, flying is seen as a long-haul thing (ter Kuile, A., personal remarks, August 17, 2020), while in Nigeria, flying domestically between the capital of Abuja and the economic hub of Lagos represents a safer and much faster trip than driving (“Coronavirus,” n.d.) and in Indonesia, it represents access to other islands of the country (Siregar, 2020). An extreme of this idea of flying as representing freedom and/or mobility can be shown in the luxury travel market, as some recurring cultural references point to the ability to choose one’s experience and privacy in an otherwise quite communal world on a plane. Having access to luxury cabins, private jets, or even just flying frequently continues to be an aspirational experience inherited, at least in North America, from the early days of commercial aviation in the 1950s and ‘60s (Brownlee, 2013), and all of these symbols are still common and enduring cultural references for privilege. Some examples clearly show the link

between personal success and interacting with airplanes: Emirates markets their First Class Suite experience as ultra luxurious and price it to match at about \$600 per hour in air (Loh, 2020a), and the rapper Drake partnered with clothing designer Virgil Abloh from Off-White to decorate his private Boeing 767 jet a sky blue with clouds, logos, and Abloh's signature descriptive labels (Graham, 2020). The image of luxury aviation especially as a reference to the mobility that comes with success is so strong that there are services that rent out private jets just for photoshoots (Martineau, 2017) to construct a faux image of privilege; or if that is too expensive, there are even pop-up sets designed for social media posts that mimic the interior of a private jet (O'Neil, 2019).

This kind of cushy experience can be inaccessible to the majority of commercial aviation passengers, with only 5% of all aviation passengers seated in premium classes (*Airlines Financial Monitor, May-June 2020, 2020*), and non-premium passengers having a much more bothersome experience consisting of endless lines, tiny spaces, seemingly arbitrary restrictions like multiple boarding zone times for one seat class, being asked to pay for small niceties, and other unkind processes. Perhaps the enduring discomfort and frustration with flying in economy class is also caused by comparing the disappointing reality of the actual experience with an immediate visual of the experience of higher-paying classes of service just beyond the Velcro curtain, and literal pie-in-the-sky residual cultural memories of past comfort. However, even if someone flies in economy, the tacit importance and je-ne-sais-quoi attached to those familiar with planes or flying can sometimes be an attraction to the transportation method itself.

This unique aspect of mobility and freedom is enhanced by a major logistical advantage over other forms of transportation, in that air travel uses the air and not the Earth's various surfaces as friction with which to function. Using the air allows airplanes to travel generally unobstructed by terrain that is otherwise very difficult to cross, such as deep mountain ranges or oceans, or is dangerous to cross due to violent activity as in the Lagos-to-Abuja route mentioned above. The flexibility and universality of air as a common factor of places where people live mean that aviation is essential to connecting remote places, such as islands (Trade and Development Board, 2014) or tundra communities (Wang, 2020) to the rest of the world. The combination of speed and nimbleness also creates a diversified market for aviation beyond just transporting people, since it allows for shipping goods, mail, and other cargo quickly and relatively easily to far-away destinations. This multi-function ability of aviation reinforces its integration in many other systems of economy, communication, social ties and

enjoyment, and also creates the conceptual linking of 'distance' to 'airplane' in many different contexts. The linking factor created by air travel also allows for its easy adoption as a frequently-used service in archipelago nations like those of South East Asia, where budget airlines like Lion Air and AirAsia ferry people from island to island, meaning that air travel is more considered a public service related to utilitarian activities (and a potentially dangerous one (Preston et al., n.d.)) more so than anything glamorous.

Another major reason to choose flying over other forms of transportation is because it is fast. A commercial airliner travels an average of 495 knots (Repantis, 2014), or about 917 km/h, which is 7.6 times faster than the average Canadian car going highway speed and two times faster than the fastest commercial train in the world (Drescher, 2018). This means that planes create a time efficiency that is currently unbeaten by any other commercial transportation method. This lack of alternative means that airlines can afford to fly their planes slower than in the 1960s (Repantis, 2014) allowing planes to be more fuel-efficient with no real threat to the more time-sensitive demographics of their customer base. The longest direct flight in the world at the time of writing is Singapore Airlines' 19-hour flight from Newark, USA to Singapore, which is targeted towards the wealthy and time-conscious by having only business class and premium economy seat options (Zhang, 2018) and is on average five hours shorter than most other flights on the same route which have at least one connecting stop. Even for price-sensitive passengers who deal with increased airport wait times, security lineups, changeovers, and getting to and from airports, the time saved by flying longer distances makes up for the time spent in the extra processes required to access the flight. The speed of aviation is one of the major factors that causes it to be essential infrastructure, since the speed is what "[shrinks] the world" (Krautkremer, 2015) and allows the ability to visit far-off places (and also to come back from said far-off place) possible within an approachable amount of time.

Of course, none of this would be possible without the economic viability of the transportation itself. The ubiquity of aviation around the world is proof that plane travel in all its various forms can be financially accessible for many people. Notwithstanding the fact that, in North America, a one-way plane ticket regularly runs in the hundreds of dollars, in relation to inflation, plane tickets have dropped by nearly 50% since the late 1970s (Thompson, 2013) and continued to generally hang steady or drop in Canada since mid-2019 (Government of Canada, 2019), up until the COVID-19 shock where there was more fluctuation. Moreover, there is a somewhat generalized method in how airlines dynamically

and mysteriously price their tickets to aim for the sweet spot between accessibility and profit: for example, tickets are frequently priced higher during office hours when businesses tend to be buying, and lower in the evenings so that more price-sensitive and independent leisure travellers can feel more ok about buying some as well (Escobari et al., 2018; Seaney, 2019). Even though it can feel expensive for an individual person to buy a plane ticket, the fact that they are within reach at all is a testament to the infrastructural iteration focusing on making sure prices are low enough to meet much of the demand.

It must be acknowledged that a plane trip is infeasible for many budgets, and the fact that air travel is within financial reach for many people in a Global Northern middle class at all is the result of a few systemic factors, including a mix of government and private ownership and subsidies of airlines and aviation infrastructure (*List of Government-Owned and Privatized Airlines*, 2016), the international price of oil (Caird & Whitehead, 2018) and high operational efficiency of the overall system itself (ter Kuile, A., personal correspondence, July 24, 2020). This means that the price of a plane ticket can be looked at through two concurrent scales of relativity: one that is customer-centric and focused on what people and businesses are able and also willing to pay, and the other one that is in relation to the huge costs that come from running an airline and flying a plane. The former is based on many factors, including general GDP, cultural factors like propensity to travel, and customer proximity to a major city (Addepalli et al., 2018). The latter is in constant iteration and competition within the industry in a race to keep costs as low as possible, and because of this pressure, airlines have created various offerings throughout the journey to encourage more financially comfortable passengers to spend more and also rely on their secretive dynamic ticket-pricing models referenced above, in order to recoup costs from the passengers where possible. These extra aspects allow for increased financial accessibility in general, and also create some bargain-hunters who “experience a dopamine rush (literally) when they find great prices” (Thompson, 2013). Merge this trend with the increase in teleworking, which rose, for example, by about 115% in the United States between 2005 and 2015 (Abrams, 2019), and other flexible work-life plans like freelance and flex hours, and there is a clear incentive for some people to allow unusually cheap flight prices to be the main determining factor in their travel plans as well.

2.1.1 WHY PEOPLE DON'T FLY

The logical opposite to people who use air travel is people who don't use air travel. Even before flying was restricted by COVID-19, some people avoided flying or just didn't use air travel at all. Kristin Salaky writes about how she was 24 years old and why she had never set foot on a plane and didn't intend to, and the first reason she lists is that she's scared of flying (Salaky, 2017). Much like how soaring through the insubstantial air can inspire fascination, it can also inspire fear of the thousands of feet of nothingness below one's chair. People with fear of flying might also have anxiety over undergoing stressful processes like security, or claustrophobia over being enclosed in a tight space inside a glorified metal tube (Seif, n.d.). Another possible contributor to fear of flight could be fear of security, especially due to memories of terrorist attacks that targeted planes like on September 11th in the USA, or other violent attacks like the Ukraine Airlines flight 752 which was shot down by Iran. People who are scared of flying might also actually be scared of crashing, since any non-intentional contact an airplane has with a terrestrial surface tends to end quickly and badly for the plane and those inside. It might be the spectacularity of commercial passenger plane crashes or the low probability of survival that contribute to why they tend to be highly reported on, which no doubt fuels the fears of those already hesitant to fly.

Another common reason to not fly is that it is inaccessible. This could mean financially, geographically, politically, or socially. Financially, flying is inaccessible because, notwithstanding how cheap a ticket is in relation to the entirety of labour, expertise, and support infrastructure that goes into making the flight happen, it is still often expensive relative to peoples' personal budgets (*Airline Outlook: Unbundling, Fare Families, Ancillaries* | CAPA, 2018; Salaky, 2017) and can be more expensive in straight amounts than other forms of short- to medium- distance transportation, like cars or trains. Most likely, the people who can't afford a transoceanic flight are not travelling across an ocean, unless they have gathered money from various sources like crowdsourcing from their friends and family for a one-way trip to move to a different place and/or are crossing illegally and perilously (*The Many Routes an Illegal Indian Immigrant Takes to Go West - Times of India*, 2019). This means that ground transportation would be their main form of transportation and air travel's main competition in this arena. This also demonstrates the recent sociocultural path-dependency of air travel from at least a Western perspective, since in the year 2020 the idea of taking a ship across an ocean, and this choice being cheaper than a plane, both seem unlikely to the point that even economic or political migrants from places like India to the USA often plan

on flying to Latin America and crossing the American southern border illegally (*The Many Routes an Illegal Indian Immigrant Takes to Go West - Times of India*, 2019). The financial inaccessibility of air travel is patchy across the world, since there are many places like Europe, China, and Southeast Asia where very cheap airlines exist for short- to medium-haul flights, but for longer haul trips, the costs of operating the bigger planes which have the longer distance capacity can cause ticket prices to be prohibitive.

Geographic barriers to access include living in a rural place that has a population too dispersed for a commercial airport, under the current hub-and-spoke format of route planning, to be financially viable or reliable (Morell, 2017), or areas where the terrain is so challenging that building an airport that is safe and functional would be extremely difficult and costly and would require a lot of will to achieve (Martínez, 2018). Political barriers could include not being able to get an ID due to a mysterious date-of-birth, or having one's country's passport be very weak such that travelling internationally causes lots of trouble (Hernitaningtyas, 2019), all the way to being awarded travel privileges due to state approval of one's loyalty, as state-supported Koryo Tours describes for North Korea's extreme case (2020a). The logistical hassles of dealing with these barriers can be very high or insurmountable for some people, thus rendering air travel inaccessible or out of consideration.

Social barriers include air travel just not ever being on the radar of someone or their community (Salaky, 2017) so it doesn't emerge as a thought option when they are trying to achieve something that air travel might have facilitated. This status of air travel being not even in a community's consideration could be due to aspects of social systemic privilege and intersectionality, where communities and people have had systematic restrictions and social barriers assigned to their identity and which over time have contributed to a conception of air travel as meant for other kinds of people. A micro example of this is, on one of my flights back from Kenya in 2014, a lady asked me to take a picture for her in front of the plane we were about to board. After doing so, she explained that she was the first one in her town to go on a plane. In her town, everyone saw planes passing overhead, but never paid them very much attention since they assumed they were for the wealthy foreign tourists visiting Kenya for safaris and not really meant for everyday locals like her. So, she would get pictures taken of her in front of each plane she could for all her work trips, in order to show them to her parents who still thought that going on a plane was a novelty. Intersectionality concerns are, by definition, multilayered: for example, notwithstanding its global reach, at the higher levels of the industry, air travel is still usually a male area and there is sometimes even more gender discrimination than race discrimination (Enelow-Snyder,

2019). This can be even down to its pilots: in the USA, a country where Black people tend to have less opportunities, Delta was rightly proud of their first all-Black female pilot team and posted a picture highlighting the event in 2017 (Delta Air Lines, 2017). These combined inaccessibility pieces are probably partially why 80% of the world hasn't ever been on a plane.

Another reason that Salaky mentions in her article is that she just hadn't thought about flying because "it just never crossed her mind" (Salaky, 2017). Based on the previous section of *Why Do People Fly*, we know that people fly for a myriad of reasons but mostly because flying facilitates achieving a person's goals faster, farther, or in a more fun, interesting, or socially approved way. If someone is used to achieving their goals without using the speed, clout, or systemic linking that air travel provides, it would make sense that they wouldn't plan on using it or relying on it.

One last reason why people would avoid air travel is for environmental reasons. This is a small but vocal minority that opposes the ecological impact that emissions caused by aviation have in contributing to global warming and climate change. This awareness gained lots of attention when climate activist Greta Thunberg sailed both ways across the Atlantic to get to the UN Climate Summit in 2019 so as to demonstrate that there was no practical clean transoceanic transportation option available (Baggs, 2019). In her native Sweden, a social movement called *flygskäm* or flight-shame seeks to activate social consciousness and create social incentive to minimize personal use of air travel and to use other forms of transportation ("What Is Flygskam?," 2019). This is easier in smaller or more condensed countries (ter Kuile, A., personal correspondence, August 7, 2020) and countries like Sweden which have relatively good infrastructure alternatives like trains, but some people have taken this movement to an extreme. A case study is Roger Tyers, a UK-based researcher who had an environmental conference in China and decided to do a round-trip by train across Eurasia, taking him two weeks in travel time alone (*The No-Fly Journey from England to China*, 2019). For environmentally-conscious people who feasibly can't avoid flying, some common steps to mitigate the increase on their footprint are to offset their carbon through funding regenerative projects (Genter, 2019), minimize their load on air travel through both number of flights they take and amount of weight they pack, and do research beforehand to choose the newest model of airplane flying that particular route or the airline with the best eco-reputation. Some airlines have started highlighting their fuel efficiency and other sustainability-focused initiatives as part of their Corporate Social Responsibility or in response to increasing eco-awareness, such as Air Canada's partnership with Less Offsets, this being significant

since Canada as a nation has historically voted against climate-related aviation regulation or initiatives on the world stage (ter Kuile, A., personal correspondence, August 7, 2020) due to its reliance on air travel for political and infrastructural unity.

2.1.2 HOW & WHY AIRLINES TRACK WHY PEOPLE FLY

Airlines, as the main organizations that run and operate air travel, tend to be quite operations-focused, as can be expected from a transportation infrastructure that deals with complex logistics. Because flying is often the only feasible method of transportation for time or terrain, the main competition that airlines have for passengers over a certain distance of trip is either other airlines or people choosing not to travel at all. Because of this, airlines have a somewhat captive market, and this means that instead of qualifying the value-add for why people might choose flight over other transportation methods, demand for flights is conceived of through an operational and financial lens and the purpose of people's individual trips is tracked instead.

There are many, many reasons why people would take individual trips – so far, some examples already discussed have been for work, for a better opportunity, for fun, running an errand, and because it demonstrates social clout, while others that me and my friends and network have personally flown for in the past include visiting loved ones, checking an item off a bucket list, doing a pilgrimage, starting a school program, going to a conference, protest, or another event, or any combination of the above. Since examining the countless possible reasons for individual trips seems overwhelming, the commercial aviation world leans hard into the other direction and sorts them for simplicity's sake into major overarching categories of purpose of travel: Business, Leisure, and Visiting Friends & Relatives (ter Kuile, personal correspondence, July 24, 2020), as well as occasional other reasons like Religious travel (Abdelghany, 2020), or Bereavement. Tracking demand for individual trips helps the airline plan for new routes (Abdelghany, 2020), although if airlines could or would use a more nuanced tracking system for why people are flying with them in general or for a particular trip, or even allowing for a combination of "purpose of trip" categorizations, other value from the myriad hidden possibilities for categorization might be captured as well. These categories are related to some back-end market segmentation based on purpose of travel, which allows them to determine the price dynamism for future flights, as well as which trip purposes are correlated with demand for flexibility and how many days

before departure the airline assumes the audiences for different ticket classes tend to plan for (Bacon, 2018). This information is used to track use of flights depending on other factors like holiday peak times, which routes are more commonly used for which trip purposes, and financial health and accounting predictions for the airline.

This last part is quite significant for airlines, since people who are flying for business tend to be less price-sensitive, since their employer, and not the traveler, is the one paying for their flights. This means business travelers also tend to be more willing to be the ones flying on tickets at more expensive prices that were booked closer to departure day, and even though day-before-departure is imperfect as an indicator for segmentation, it is widely used (Bacon, 2018). There is also an assumption that people traveling for business will be more likely to choose a seat in a premium cabin, which is important for airlines as premium tickets go to about 5% of their total passengers but make up between 30-75% of the airline's revenue depending on the airline and route (*Airlines Financial Monitor, May-June 2020, 2020*; Investopedia, 2019) So, there is incentive for airlines to track which of their passengers are taking a trip for these three reasons, or which routes are more likely to be highly-trafficked by people taking a specific kind of trip.

However, since not all people can or want to fly in a premium cabin, market differentiation has led to airlines like Emirates or Singapore Airlines who cater to people who want a premium experience, no-frills airlines like Ryanair and Southwest who cater to people who are very price-sensitive and not going on a long-haul trip, and airlines who have multiple classes on one plane. For the latter category of airlines, there is pressure to compete with both ends of the price and amenity spectrum, with the inclusion of unbundling services by charging small fees for services like checking a bag as a "profit maximization strategy" (*Airline Outlook: Unbundling, Fare Families, Ancillaries | CAPA, 2018*). The strategy behind this is to be accessible to price-sensitive people and create more demand by making base fares look really cheap (ter Kuile, A., personal correspondence, August 17, 2020), and also to compete with the budget airlines. Even though there are strong financial incentives to try to push economy travellers to book the more expensive tickets through creating an increasingly uncomfortable experience in the cheaper seats (Abad-Santos, 2017; Wu, 2014), the widening inclusion of semi-premium tickets for classes like premium economy could be seen as a reflection of improving awareness of a more nuanced understanding of what people might be willing to pay for their flight.

Also, there is an increasing recognition on the part of some airlines that adapting a more holistic sense of understanding their customers might be useful in setting their brands up for success, to a point. For example, in January, Delta was considering reducing or eliminating annoying change fees for all ticket levels to try to be a “trusted consumer brand” (Bastian in (Leff, 2020)), especially since change fees can be a barrier to people choosing to fly in the first place, but it was still maintaining its Basic Economy class at the same time (Leff, 2020). As this article was written in early January and the USA advised its citizens to avoid international travel in March due to COVID-19, Delta might have fast-tracked or is testing this initiative, or is just following standard post-disaster procedure, as it has temporarily waived change fees for trips specifically affected by the coronavirus pandemic (*Can I Cancel/Change My Flight?*, 2020). If it has actually done away with change fees, then Delta would be taking a beginning foray into providing a differentiating factor that might support some of the hidden and uncaptured reasons that people fly and it might be an interesting experiment to see if they can discover any uptick in demand because of it. Overall, the ability for airlines to track why people are flying or not flying has impact on how they strategically operate and choose their future direction, both in a literal sense of the word ‘direction’ referring to where the planes will be going, and also in what kind of offering they can provide their passengers in relation to other airlines.

2.1.3 WHY DO WE CARE WHY PEOPLE FLY?

Overall, understanding the reasons why people choose to fly or not fly, before COVID restrictions grounded most of the planes, is helpful for uncovering the strengths and vulnerabilities underpinning the air travel industry, and predicting the future directionality of trends affecting it. Depending on how long travel restrictions are kept in place, and how comfortable people become with the new modes of being and systems of operation that they have created for themselves in air travel’s absence, these reasons why people fly or don’t fly might be stronger or more entrenched, or COVID could cause a strong exodus from the flying camp to the no-fly camp. These reasons why people fly or don’t fly might also be useful in adapting air travel to post-COVID concerns or evaluating the probable success of any infrastructural replacement. They also give good context to the data collected in observing online communities, and the proceeding analysis and synthesis of this study.

2.2 A SHORT SWOOP INTO THE AIR TRAVEL INDUSTRY

2.2.1 QUICK FACTS & MAJOR PLAYERS IN THE AIR TRAVEL ECOSYSTEM

Airplanes and aircraft

- An airplane is a vehicle that flies through the air using the lift generated by the shape of its wings and the thrust provided by its engines. They are designed and made by companies like Boeing, Airbus, and Fokker.
- A turbofan engine is the most common jet engine, and it is comprised of a central engine surrounded by a large intake fan that passes air around and through it. They are made by companies like Rolls-Royce, Pratt & Whitney, and Honeywell.
- Traditional jet fuel for long-distance planes is comprised of a very high grade of kerosene, derived from crude oil. It is manufactured and distributed by companies like Shell, Gazprom, and Air BP. For shorter flights or for flights in very cold weather, naphtha is another high quality oil derivative with a lower freezing point.
- Planes are designed for capacity for distance, and so for simplicity's sake trips are sorted into short-haul of less than three hours of flight time, medium-haul between three and six hours of flight time, and long-haul of over six hours (Wilkerson et al., 2010).

Airlines

- Commercial passenger aviation is run by airlines, the businesses who buy the planes, decide routes to fly, decide prices and what amenities they'll offer, hire the pilots and ground crew, and do all the paperwork for each flight.
- Airlines can be flag-carriers, which is a holdover from the early days of air travel (Stewart, 2019) and which means they were designated as the national representative of their country of origin. Some examples are Air Canada, Singapore Airways, KLM for the Netherlands, and Emirates Airlines. Even if a country's airline is a very minor player on the world stage, air-travel-wise, they might still be a flag carrier, such as Air Koryo for North Korea.
- The biggest airlines in the world by number of passengers include Southwest and Delta (WATS: *World Air Transport Statistics, 2019*).

- The biggest airlines in the world by RPK (Revenue-Passenger Km) include American Airlines and Delta again (Binkley, 2019)
- The biggest airlines in the world by routes flown include Ryanair and American Airlines (Binkley, 2019).
- Other airlines consistently in the top 10 of these metrics are China Southern, United, Ryanair, easyJet, Air China, China Eastern, and Turkish Airlines.
- Budget airlines, focusing on providing low price points and corresponding low amenities, include Ryanair, Southwest, and AirAsia.
- Airlines that are renowned for luxury experiences include Singapore Airways, Emirates, and Lufthansa.
- Many airlines that fly long-haul include a mixture of both low- and high-cost fares and corresponding amenities, such as Delta, KLM, or Air Kenya.

Airline organizations

- Airlines can form large international alliances, which allow for people to buy a ticket for one direction and have it be for multiple airlines through code-sharing. The three biggest alliances are StarAlliance, SkyTeam, and OneWorld.
- Airlines are overseen and represented by the International Air Transport Association (IATA), a trade organization who advocates on their collective behalf, collects and analyzes data from a global perspective, and helps formulate industry policy (*About Us*, n.d.).
- Airlines can be privately or government-owned, or a mix of the two. In 2016 the year of the latest data set, a majority of all global airlines were owned at least in part by their government (*List of Government-Owned and Privatized Airlines*, 2016). That percentage might increase due to COVID as with the example of SAS having the governments of Sweden and Denmark participate in its recapitalization structure for financial survival (Khatemi & Färlin, 2020)

Airports

- Most large airplanes have to land at airports, which can accept different sizes of plane depending on their runway size and capacity. Airports can be government-owned (e.g. Singapore Changi) or privately-owned (e.g. London Heathrow), or private but rented from the government (e.g. Toronto Pearson) (Loh, 2020b). Airports are represented internationally by

ACI (Airports Council International) which advocates for them on the world stage and fosters partnerships and information-sharing.

- The complex directions, orders, heights, and takeoffs & landings in the airspaces above airports are managed by Air Traffic Controllers, who are hired by the national organizations for airspace safety, like Nav Canada. These national airspace safety organizations are represented by the Civil Air Navigation Services Organization (CANSO).

Governance

- Air transport in general is regulated and overseen by the International Civil Aviation Organization (ICAO), an agency of the United Nations and one of the few international organizations with the power to make legally binding structures that can apply to the global infrastructure that is air travel.
- ICAO is formed of the assembled global nations, or more specifically their transport ministries, who operate the day-to-day air travel and air transport out of their own countries. There are also many other organizations that have observer status, including the aforementioned IATA, ACI, and CANSO.
- Governance and regulatory structure follows UN protocol, in that each country gets one vote.

2.2.2 THE IMPACT OF COVID-19

The COVID-19 pandemic in early 2020 caused an unprecedented and massive shock to the air travel system. Originating in Wuhan, China, the new coronavirus that causes the disease COVID-19 rapidly spread throughout China during the high-volume Lunar New Year travel time, and from then spread elsewhere in the world. As people can be contagious without or before showing symptoms, and the virus has the ability to quickly overwhelm a person's immune system, countries started closing their borders and imposing quarantine lockdowns on their citizens in order to slow the spread of the virus. This led the people under lockdown to transfer much of their social, work, and other needs to online or digital channels, including connecting with faraway people through video call.

This had an immediate and shocking effect on the air travel industry: across the world, demand for flights dropped by 98-99% (Government of Canada, 2020) and has continued to stay low for months.

The fallout from COVID-19 is that many airlines switched to carrying what cargo and mail they could instead of passengers (ter Kuile, A., personal correspondence, July 24, 2020), some airlines have gone bankrupt like LATAM and Virgin Australia (Bloom, 2020), some airlines have needed bailouts like Air Canada, Delta, and Ryanair (Otley, 2020), and some airlines have had their governments be included back into their ownership structures like SAS. All have cut back on routes and frequency, like Air Transat cancelling all flights from Western Canada to warm tropical destinations this winter (2020c) which is significant since Canadians visit warmer weather en masse, put planes in storage (*Airlines Financial Monitor, May-June 2020, 2020*), canceled new orders for planes like the superjumbo Airbus 380 and retired older planes like the Boeing 747 (Pallini, 2020), and placed valuable pilots on furlough (Chokshi, 2020) if not letting them go. The fallout is still ongoing, and some predictions say that it will be years if air travel recovers to the point of 2019 pre-COVID levels, if at all (*Hard Landing - Coronavirus Is Grounding the World's Airlines | Business, 2020*). At minimum, the increased sanitization measures will be an extra ongoing cost for everyone interacting with air travel, from passengers to airport security to airline maintenance. So, as the people and companies in air travel are forced into re-strategizing because of the COVID shock, now is a good time to also reimagine the potential for sustainability as well.

In non-air travel impacts, COVID, like all crises, has accelerated trends that were already emerging. The rise of digital devices and communication tech has had a huge rise due to work-from-home orders and lockdowns, and so this means that people use their digital devices to do things they would otherwise have done in person, like hang out with friends, get groceries, and exercise with. Plastic pollution is rising due to so many disposable sanitization tools and gear, like masks and gloves (L. Boyle, 2020). Economic inequality is also rising because people of low socioeconomic status are more likely to catch and die of a disease like this, making the coronavirus deadlier and then also setting off an economic feedback loop of declining economic rates (Fisher & Bubola, 2020). And since many social services were put on hold, wealthier people have hired private replacements like schoolteachers (King, 2020). It is still too early to be sure what the complete effects of the pandemic will be, but as the new restrictions become ongoing restrictions, people will adapt to achieve their goals notwithstanding their limited mobility.

2.3 KEY PRINCIPLES OF SUSTAINABILITY

Aviation and other large-scale, complex infrastructural pieces have contributed to the creation and ongoing characterization of the current age of the earth, which is the Anthropocene. The Anthropocene refers to “the period of time during which human activities have had an environmental impact on the Earth regarded as constituting a distinct geological age” (“Definition of ANTHROPOCENE,” n.d.) which means the whole biosphere of the planet. The processes that helped create the Anthropocene generally started during the Industrial Revolution during the mid-18th century (Crutzen, 2006; McGregor et al., 2016), although a recent study looking at ice cores from Quelccaya Ice Cap in Peru suggests that the Anthropocene began at different times in different places, as there is evidence of atmosphere-damaging particles from smelting, metallurgy, and mining in the Andes from the 16th century (Wade, 2015). No matter what, the Anthropocene was created when manufacturing was systematized and large amounts of resources were extracted from the earth and consumed in innovative ways. The emissions from this large-scale systemic mechanization contributed a gradual but inexorable rise of greenhouse gases such as carbon dioxide (CO₂), nitrous oxide (NO₂), methane, water vapour and ozone (O₃) (*Which Gases Are Greenhouse Gases?*, 2013), and also artificially-created gases such as chlorofluorocarbons (Crutzen, 2006) into the atmosphere as seen in glacial and polar ice cores containing frozen molecules from thousands of years ago. Around the world, this innovation of manufacturing both required new infrastructure, such as electricity, and created new infrastructure, such as the internal combustion engine. As more new inventions are reliant on previous inventions and infrastructures, the previous infrastructures’ legacy became that of society expecting the availability of services provided or facilitated by the infrastructure, and this allows for growth in invention, infrastructural reach, and unfortunately also climate costs.

That we were in a new geological age characterized by us humans being the main driver of change in earth’s ecosystems became clear after World War II in “the 1950s, when all kinds of socioeconomic trends began accelerating” (Blasiak, 2020) such as tripled population growth and resource consumption associated with fulfilling the food and other needs associated with it, on sea as well as land. The interconnected systems that were created or expanded on in order to support this growing population have also compounded on each other. This creates an effect wherein some resources, especially non-renewable ones like crude oil, are starting to approach a Seneca Cliff-like

scenario, wherein a constrained resource is overused and the aftereffects and pollution of its unrestricted use eventually overwhelm the resource system, generating a graph with a steep cliff and demonstrating the “results of delayed consequences for our actions” (Bardi, 2011). It is for this reason that there have been increasingly urgent petitions signed by hundreds of scientists in all areas of the world asking to have climate change mitigation strategies as a priority (Ripple et al., 2019), lest we inexorably lurch towards a climate crisis that might already have arrived. The International Panel on Climate Change strongly recommends that we keep global warming to only 1.5°C by 2040 as a constant across the globe (Allen et al., 2018); however some places have already sadly arrived at this number, and there are more destructive feedback loops being discovered in the world’s ice caps (Carrington, 2020) that will most likely hasten our collective surpassing of this warming cap.

In an ideal world, all human processes would be ecologically regenerative. Failing that, in order of higher ecological friendliness: the resources we use would be endlessly reused in a circular economy, we would invent and use exclusively clean and non-damaging tech and processes, or at least the amount of resources we consume as part of our processes would be at ecologically sustainable levels. Regenerative means processes that add benefits to the natural environment they extract from; a circular economy implies that all the products we extract and manufacture would also be the sourcing for other products in an endless chain without waste; and sustainability means making sure the baseline that existed in the ecosystem before extraction is maintained even through extraction processes. While there are many historical and traditional human systems that have succeeded at consistent ecological discipline and regeneration, the more recent runaway effects of the capitalistic Industrial Revolution and concurrent colonization of less powerful areas of the world have created a somewhat consistent financially-aware status quo at the higher levels of industry and international governance, to which most countries in the world are expected in some degree to adhere to in order to gain access to the world stage (Salamah, 2016). This means that the well-off people in wealthy countries tend to have a higher quality of life but are also much higher emitters (Ritchie, 2018a) due to a longer history of acquiring and using resources in a capitalistic way. The poorer countries also tend to emit much less (Ritchie, 2018a), which means that any climate change-related action should be mostly targeted towards the wealthier people or countries. This also presents a layer of complexity when looking to adapt air travel for sustainability for the future, as any movement in the direction of stopping planes would be met with lots of justified opposition from all sides: wealthier people enjoy the access air travel provides, and poorer

people and nations know it to be a useful tool for building competitive capacity as well (Daley, 2009). In the generally capitalist structures that global governance entities subscribe, this turns into a strategic political game between wealthy countries who have access to air travel, produce a lot of emissions, and have populations who have a strong desire for climate action, and countries who produce far less than the average amount of emissions, have populations who have strong desires for economic opportunities and international power, and are building their air travel capacity with less regard for sustainability.

In short: in many ways, emissions and climate change is mostly a product of the extractive and destructive activities of internationally wealthy entities who also live in places where climate change is and untangling the system so that it incorporates more ecologically and socially respectful practices will require a great deal of collective energy, empathy, and commitment. Attempts at creating this sort of international cohesion have taken place at various types of UN Climate Conferences and also with the Kyoto Protocol in 1997 and the Paris Agreement in 2016. While so far only two nations, Morocco and the Gambia (Mulvaney, 2019), are on target for the Paris Agreement, the international shaming of the United States when it threatened to withdraw (Watts & Connolly, 2017) and Canada when it withdrew from the Kyoto Protocol in 2011 (Carrington & Vaughan, 2011) demonstrates at least a recognition for the need for collective and cohesive action.

Air travel as an industry and travellers as passengers also have some ecological responsibilities. The engine and fuel structures that airplanes rely on to propel themselves against gravity are built around burning highly concentrated fossil fuels, which generates greenhouse gas emissions, predominantly carbon dioxide (CO₂), various Nitrous Oxides (NO_x), soot, and water vapour (Timperley, 2020). Air travel's ecological damage is compounded by the fact that emissions in the high atmosphere have a greater negative effect than those emitted closer to the ground (Schumann, 1994). Although there are many other aspects of human life that contribute more to global warming than air travel including most other mechanized transport, and even though aviation contributes only about 5% at the most generous estimate including its high-atmospheric impact towards total global emissions, taking a flight is one of the most carbon-expensive things a person can do, due to the relatively high emissions per plane passenger. This problem is compounded by the social inequality of taking a plane, especially for long distance, since this is often accessible only to the internationally privileged but the negative ecological consequences of global warming and climate change disproportionately affect the poorer and more vulnerable areas of the world (Bohle et al., 1994; Mendelsohn et al., 2006). As access to flying

increases through growing economies and increased segmentation, aviation and leisure travel were some of the fastest growing transportation industries pre-COVID, which is good for international socioeconomic inclusion but also implies the ecological impact of aviation was likely to increase as well, further reinforcing the characteristics of the Anthropocene. To illustrate this but through its reversal: on April 17th, 2020, the ongoing COVID-19 pandemic travel and lockdown restrictions caused a global drop of 17% in emissions, although on the same day about 90% of all global emissions came from places under lockdown (Storror, 2020) implying that it is far more than air travel that also needs to change. In the month of April, though, the lockdown peak in each locked-down place was down about 25% from transportation emissions alone (Le Quéré et al., 2020) so this implies that the impact of sustainable or even regenerative practices in this sector would have a good global positive impact for mitigating climate change.

2.4 WAYS IN WHICH AIR TRAVEL IS TRYING TO GO MORE GREEN

Reimagining air travel for sustainability is a big consideration for one overarching reason: aviation is a recent infrastructure. With the jet engine having been invented concurrently by two different people during World War II (Bellis, 2019) and adapted for peacetime, the design and engineering of the first long-distance commercial passenger planes directed towards comfort (*A New Generation of Airliners | America by Air, 2007*) and social systems surrounding air travel that took off in the 1950s and 60s, everything about air travel's roots was more focused on performance without noticing the ecological cost. Most of the dominant human systems in the Global North haven't included ecological regeneration as a priority output for hundreds of years, which can clearly be shown by the abovementioned Industrial Revolution and extractive colonization practices by European and East Asian nations. This status quo has created expectations around the world in business, governmental, and social functioning, and is the milieu in which commercial passenger air travel was born and has thrived. This means that air travel facilitates many of these globalized international systems and is a component of the status quo, and so any change to air travel's structure might generate significant socioeconomic ripple effects to the people who rely on the facilitation air travel provides or are one of

the many thousands hired in air travel or its support industries, the people who hope to use it as a vehicle to generate opportunities, and the varying degrees of economic stability provided by companies and nations who use air travel for their needs as well.

This means, because of its complex nature and the high risks that come with fast change, the most effective initiatives in improving air travel's greenness have been in small but consistent improvements in many interrelated areas over decades. Due to the results-based and safety-based core tenets of the air travel industry, it has developed lots of practice in designing for future threats, and so has had a head start on many other infrastructures in incorporating sustainability practices into its makeup. This bringing together of different initiatives in pursuit of a common goal might be illustrated well by looking at airplanes themselves, which are made up of components from many different industries from different parts of the world and which are brought together in a technical and intermeshed way over many years.

2.4.1 AIRPLANE TECH IMPROVEMENTS

Here are some things that airplane manufacturers have iterated on to reduce emissions so far. Since burning fuel is what generally creates the most direct emissions, and due to the high degree of operational efficiency in the system shifting a significant part of the major cost structures over to fuel (Saxon & Weber, 2017), this gives airlines strong financial incentive to be as fuel-efficient as possible while also cutting emissions. In relation to fuel economy, turbofan engines - the most common type of jet engine - with wider intake fans are actually more efficient due to more air flowing through the engine, so some companies like Rolls-Royce are experimenting with massive intake fans (Morris, 2020). The weight of the plane is important since a heavy plane will burn more fuel to go the same distance, and planes with four engines are much less efficient than planes with two engines due to lower passenger densities and other "inherent design factors such as a higher wing weight and a smaller engine fan diameter" (Rutherford, 2018) so design of many elements within a plane, such as the seats, have been iterated on to be lighter. Much of the plane's emissions tend to be on taxiing around an airport and on takeoff (Schlossberg, 2017), when the most thrust is needed to get the plane into the air. Because of this takeoff emissions spike, short-haul flights tend to be less efficient than medium- or long-haul flights, since the plane is expending the same amount of energy to take off but for a shorter time in the air, and

would presumably go on more frequent trips which means more takeoffs and taxiing. To help with this short-haul efficiency problem, some airlines like KLM have been partnering with ground transportation, in this case the high-speed train company Thalys, to code-share and so minimize short-haul flights (*Air France-KLM Sustainability Report 2019 Available Now*, 2020). Some other aspects of a plane's physical attributes that have been innovated on for sustainability include creating and blending biofuels and fuels from other materials like used cooking oil, forestry residue, or municipal waste into sustainable airplane fuel sources (*Sustainable Aviation Fuels*, n.d.), creating some elements of a circular economy wherein parts and materials from retired planes are reused for new ones (*Aircraft Disassembly & Scrapping*, 2020) and even something as simple and small as adding winglets to the ends of wings and retrofitting them on old aircraft as well can make a flight more efficient by reducing drag and turbulence (Nudelman & Zhang, 2017). All together, these iterations on plane tech and engineering have caused emissions from air travel to drop by 80% since the turbofan jet engine was invented in the 1960s (*Facts & Figures*, 2020) and by more than 50% since 1990 (*Carbon Emissions Per Passenger Decrease More Than 50% Since 1990*, 2019). Since planes can take up to 10 years to be developed and tested before they are allowed to be delivered to airlines (ter Kuile, A., personal correspondence, August 7, 2020), the successes in efficiency that are already appearing demonstrate the industry's good capacity for really-long-term strategic thinking and implementation over such a long lead time.

2.4.2 OTHER ADJACENT TECH & EXPERIENCE IMPROVEMENTS

None of this could happen in a vacuum, especially since aviation is a hugely complex and generally international industry that has many levels of safety certifications that it needs to pass first. So, other administrative initiatives that are intended to create structural change towards sustainability include: retiring older and more inefficient planes, which has been fast-tracked by the coronavirus shock (Pallini, 2020) having airports run on renewable energy, like Cochin Airport in Kerala in India as the first major airport completely run by solar panels (Menon, 2015), and giving passengers reusable or edible onboard cups & plastic coverings to reduce waste (Bernabe, 2020), as well as reducing waste in other areas as well. In larger structural areas, KLM / Air France ranked first in airlines again on the Dow Jones Sustainability Indices, due in part to small but consistent ecological considerations such as creating European infrastructure for aviation biofuels (*Air France-KLM Sustainability Report 2019 Available Now*, 2020). The implementation of fees for many things in economy classes and no-frills airlines is annoying,

but is causing incentive for economy passengers to pack their own reusable food and maximize their carry-on luggage to avoid a checked bag fee – so it can be extrapolated that these fees have a downstream effect of contributing less waste, and having less heavy checked bags allows airplane to be lighter and more efficient in its use of space. Finally, more and more airlines have offered carbon offsets to their passengers or taken it upon themselves to offset their activities, like JetBlue recently did for its domestic American flights in the largest airline carbon-neutrality scheme in the world at the time of writing (Boon, 2020). Although offsets are considered a band-aid solution in the environmentalist world since they can allow polluters who have the resources to essentially buy their way out of responsibility for emissions (Song in (Irfan, 2020)), for an industry with such slow-moving technological lead times as aviation, they are a good way to literally buy climate time until technology that is fully clean can catch up, be tested and certified for safety, and be mass-produced for the international market.

2.4.3 SUPPORT FROM UP HIGH

On the administrative and governance end, there is a widespread recognition that eco-responsibility is important to incorporate into the aviation world. To that end, the ICAO has CAEP (the Committee on Aviation Environmental Protection) which is made up of several member states from all continents that people live on and international observatory organizations, and runs framework and guideline programs, including CORSIA (Carbon Offsetting Reduction Scheme for International Aviation) which focuses on carbon offsetting and reduction in emissions as a set of targets and agreements. They also have GFAAF (Global Framework for Aviation Alternative Fuels) focusing on sustainable aviation fuels, and E-HAPI (Electric and Hybrid Aircraft Platform for Innovation) for electric and hybrid aircraft development. Since UN organizations move very slowly and non-precisely and the ICAO is no exception, the ATAG (Air Transport Action Group) was formed as an international non-profit made up of industry leaders from all sectors of aviation to coordinate strategy and solutions for issues affecting the whole industry, which recently has mostly “been focused on reducing aviation emissions” (Who We Are, 2020). Members include airplane manufacturers like Boeing and Airbus, engine makers like Rolls-Royce and Pratt & Whitney, and governance organizations like IATA and CANSO. This means that aviation and air travel actually have much more formal internal structures and avenues in place to help the whole industry and infrastructure become more eco-friendly, and the incremental improvements in

all areas have led to newer jets having a similar fuel efficiency as a full compact car (*Facts & Figures, 2020*). So, while change in aviation takes a while because of long lead times on new planes, approval and safety certification processes, the slow governance and the international nature of the industry, overall many players in air travel are taking steps that are showing environmental progress.

2.4.4 WAYS THAT AIR TRAVEL IS NOT GOING GREEN

However, while aviation has done a lot to contribute for their own industrial sustainability, it is still constrained by lack of consistent prioritization towards sustainability across the industry as a whole, which has led to some ecologically unfriendly decisions. Since it is a global infrastructure, these decisions can occasionally affect the whole industry and hold everyone back. For example, notwithstanding the relatively easy nature of swapping out fossil fuels for other approved, safe, and functional sustainable fuels, these Sustainable Aviation Fuels (SAFs) are rarely used consistently because they are in average up to four times the price of fossil fuels (Sillers, 2020). This lack of demand from airlines has created a catch-22 wherein the lack of interest has led to a generalized lack of investment in sustainable airplane fuels (SAFs) outside of Europe, causing prices of SAFs to remain generally high and dampening demand. While in pre-COVID times this focus on finances was shown more through lack of sustained or significant investment in sustainability initiatives, the shock of COVID has had a clarifying effect as industry players have had to make tough decisions in their adaptation strategy. An example of a pre-COVID program aiming at creating future sustainable systems is the E-Fan X, a Rolls-Royce & Airbus hybrid engine plane prototype. As Christopher Schaberg from *The Atlantic* writes, this prototyping was slightly odd in a few ways: it was put on a British Aerospace 146, which is a quadjet and an old plane on its way towards being phased out of service, and the one hybrid engine was printed bright green (Schaberg, 2018), seemingly as a marketing stunt. However, of the hybrid and electric planes and prototypes listed by the ICAO, it had by far the longest capacity for distance and was the biggest in terms of passenger size (ICAO Secretariat, 2019). It's possible that placing this engine on a quadjet was for safety redundancy, with three other engines to support if the hybrid prototype failed, and also possible that Airbus and Rolls-Royce were interested in exploring the sustainability-friendly direction of extending the lifespan of their older planes and reducing waste rather than pushing the most modern technology. However, these are questions that shall remain unanswered since the program was bilaterally cancelled in April 2020 (Vittadini, 2020), the timing of

which implies it was due to coronavirus pressures, a year before the plane would have taken its maiden test flight (*This New Airbus Facility Will Help Zero-Emission Technologies to Take Flight*, 2019).

During the time of almost complete formal travel bans across the world to stop the rapidly spreading pandemic, airlines were forced to fly empty planes with no passengers called ghost planes on some of their regular routes, so as not to lose precious and coveted landing and gate time slots. While in Europe this practice was temporarily paused within a few weeks of lockdowns (Bowlin, 2020), in the USA airlines who applied for bailouts under the American CARES Covid-response act were essentially forced to continue flying them as air travel is considered a logistics lifeline, and if they stopped flying then “federal and state government agencies would need to charter as many as thousands of flights daily, at far greater cost than CARES Act [which means the aviation bailout] grants ” (Mann in (Slotnick, 2020a)). This highlights once again the financial constraints and focus of the general status quo that air travel finds itself in, since the American government was mandating airlines fly expensive flights so that the government agencies themselves could avoid spending more. The European ghost flights existed because of intercompetition between airlines for a tight resource, which is the airports’ operational capacity, and that these ghost flights existed at all shows that maintaining future competitive edge was prioritized even in a moment of crisis. Moreover, in general, investment into air travel sustainability seems to be reliant on the airlines themselves, or in some cases the governments of the airline’s home base. The cancellation of E-Fan-X due to COVID-19 pressures implies that the sustainability practices of airlines and other industry players are reliant on the financial solvency of the businesses such that they feel like they can invest in green measures (ter Kuile, A., personal correspondence, August 24, 2020), and the extreme financial pressures airlines and other air travel industry players are under post-COVID will likely lead to a doubling-down on financial focus above all else.

Because of this, the COVID-19 crisis has provided a financial opportunity for various, more unscrupulous entities in the air travel industry to both lower their costs and try to grab market share from other entities, especially those that are taking the shock as a chance to reevaluate their strategy to be more environmentally-friendly (ter Kuile, A., personal correspondence, August 7, 2020). This could leave airlines and industry players who have invested (or who do choose to continue to invest) in sustainability capacity-building infrastructure more financially vulnerable than they already were. In a post-COVID world, this means that there will most likely be a stronger price differential between greener airlines and those who don’t care about the climate, and this provides a disincentive for sustainability

investment for industry players who are already locked into prioritizing financials by their international milieu.

There is most likely a “strong correlation” between where the airline is based out of and how sustainable it is (ter Kuile, A., personal communication, August 9, 2020), which means that the airlines that are based out of societies and governments that care more about sustainability are more likely to have incentives and regulation that encourage the airline to enact sustainability measures alongside the financial concerns. Air travel has, in most senses, incorporated consistent small improvements towards sustainability over decades, which means it’s much, much cleaner than it was before, and this should be celebrated and looked up on as a model for other transportation industries. However, with potential growth in emerging markets competing with the aftereffects of COVID-19, the predictability of the climate impacts of aviation is up in the air, difficult to measure, and potentially a moot point – if climate metrics are nearing the Seneca Cliff and it turns out that we cannot wait for technology to progress in the slow way that it has been for the past few decades, forcing change might be necessary. COVID-19 could be one factor that enforces a traumatic pause on the air travel industry and how it functions, so as the air travel industry is seeking to understand the best path forward, it should be looked upon as a good opportunity for industry players to lean hard into their culture of safety and expertise, and take the lead on reprioritizing for environmental sustainability as well.

CHAPTER 3: METHODOLOGY

3.1 DATA GATHERING

As air travel is a complex and dynamic international system, reimagining it for lasting sustainability is a challenge. In order to explore how to do this, a multi-pronged and qualitative approach was deployed, focusing on the social discourses about air travel and involving a literature review and SWOT analysis for formal macro system information, a netnography and a Verge analysis for informal micro interpersonal information, and an infusion of both discourse streams at the end. This social discourse analysis is very similar in methodology to institutional ethnography, as defined by Dorothy Smith as an “examination of work processes and study of how they are coordinated, typically through texts and discourses of various sorts” (Smith, 2005). The main fundamental difference is that I am looking at how people interact with a system that is not their workplace, but is more of a systemic overarching & entrenched service that they are regular clients of.

Data was acquired online through a literature review for more factual and systematic contextual pieces, and a netnographic scan to complement the literature review and to include people-focused reimagination possibilities. Netnography is ethnography on the net, or humanism-focused online research that “[follows] people & topics, practices & meanings, [and] sites” ((Kozinets, 2015), p. 16) and across platforms including social media. This practice was particularly useful for conducting research during COVID-19 lockdown, as it encourages actively looking at online places where people gather, share, and discuss their opinions, in formats that are handily already published, all without needing to deal with the terrifying prospect of leaving my apartment during a pandemic.

Because the scope of this project is heavily focused on larger-scale infrastructure and economic systems, I traced online social discourse and interaction across a broad range of online communities, platforms, and information hubs including news sites, op-eds, blog posts, social media platforms, and bulletin board services for references to the cultural zeitgeist. I would also follow topics and people or communities like frequent travellers, ecological activist communities, travel companies, aviation organizations, and through academia. In order to dive deeper into these worlds, I allowed myself to get lost in click-vortexes of recommended or similar material so that I could discover potential

common pathways of information consumption and interaction for people in these online communities, since these pathways would most likely inform their discourses, the way they perceive aviation and prioritize aspects and semiotics of air travel, and contribute to mental models they might collectively have for the future. Following click-vortexes and gaining observational information in this way is possible because some back-end tracking processes on websites and platforms are designed to record how a user moves around the website, so that they can tweak the user experience and also recommend advertisements (Hoffman, 2016). The main purpose for this back-end website facilitation is often for maximum engagement on the site and to that end can intentionally encourage psychological biases including confirmation bias (Ri, 2016), so in order to find balance, I also simultaneously kept track of online publishers' biases on mediabiasfactcheck.com (About, 2020) if applicable, and tried to go down parallel click-vortexes using sources with different slants. This literature review with netnographic elements acted as future-facing trend-scanning for the foresight work as well.

As part of context scanning and foresight trend gathering, the main news platforms I would check as a matter of routine were BBC, CBC, National Post, the Economist, Forbes, and Business Insider – altogether giving me a very slight left bias. The main social media apps I checked were Instagram and Twitter, and the main social sharing sites were Reddit, Youtube, and BuzzFeed. These would often link to reports from large governance organizations like the IATA, ICAO, the IPCC (Intergovernmental Panel on Climate Change), and the ICCT (International Council on Clean Transportation). Across all sources, I intentionally looked for authors from varied countries, backgrounds, and lived experiences so as to be as inclusive in the scan as possible. Data was gathered over the course of five months and due to its various formats was collected in various ways: regularly checking and refreshing news apps and articles provided the latest points; looking through social media networks or mentions or clicking through article recommendations allowed for somewhat more targeted results; using university library, JStor, and Google Scholar searches allowed for more scholarly article recommendations; re-searching using synonyms of keywords allowed for a slight increase in diversity of results; and informally asking my personal network for any recommendations they may know allowed for more results outside of my own search bubble algorithm.

3.2 ETHICS

Following the guidance on online research from Markham & Buchanan (2012), some ethical considerations and boundaries were strictly followed. In order to preserve ethical boundaries and to minimize any unintentional harm caused by my observational position, it was necessary to consider that “all digital information at some point involves individual persons” ((Markham & Buchanan, 2012), p.4) and especially so in netnographical and online literature review methods. Air travel is generally not considered a sensitive subject, so I was more open to looking at comments on forums and websites, especially if the poster seemed to be using a username with numbers and common words and not their real name, and if the poster was posting in a public forum with some signals of knowing their posts would be read by the public. Storing data was also not a problem, as I referenced online sources wherein the data was already hosted somewhere else. However, continuing an ongoing process of questioning what the future of ethical considerations could be was a helpful undercurrent in maintaining respect for the people and sources I observed in my most complex source area: social media.

For maintaining ethics in looking at social media, I mostly looked at verified social media sources, which are represented by a blue checkmark next to the username on Twitter and Instagram. Verified accounts are accounts that either Twitter or Instagram has confirmed are authentically a well-known person, organization, or brand (*Verified Badges | Instagram Help Center, n.d.*)(*About Verified Accounts, n.d.*), and this means that the verified person has intentionally contributed their personal information to be known as public and the posts they share on their verified pages are known as public as well. No sourcing from social media accounts marked as Private was considered, and if an account was marked Private or the post was deleted after I discovered it, I removed it from consideration in order to respect the poster’s wish for increased social media privacy. The only exception to these rules were private and unverified Instagram meme-reposting accounts, since setting themselves as private is an intentional strategy to gain more followers (Lorenz, 2018) and only public accounts can be verified (*Verified Badges | Instagram Help Center, n.d.*). An internet meme is “an amusing or interesting item (such as a captioned picture or video) or genre of items that is spread widely online especially through social media”(“Definition of MEME,” n.d.), and this broad online spread is successful because memes tend to become inside jokes and inside references but across broader internet communities. Since the owners of the private meme accounts are often anonymous themselves, I only considered meme accounts that

had over 15 million followers as a sign that they were well-established and trusted by the community on the platform. Also, since the biggest and most-followed meme accounts often repost from various other social media or news outlets, for the sake of preserving anonymity of the original posters I only considered posts that had no other identifying information associated with them or were associated with another meme account.

This focus on verified accounts had the effect of limiting the amount of data I could collect, since many of the posts I would see on all social media platforms were from unverified accounts, even if the posts were viral and accumulating a significant amount of reach. There is also a reference to personal privilege in being individually verified by a social media company, since it requires the person to have reached a level of success in relation to the status quo and be supported by institutions and companies who have hired or promoted them to be public-facing. This means that many of the accounts that I saw that were sharing lived experience of more minority communities were unusable for this study, since even if they seemed trustworthy through community spread and consistent attention growth, they were not verified through the social media company and that meant I didn't have a clear indicator of if the poster was intentionally posting with a public audience in mind. Functionally, this means any people or groups who have greater degrees of disenfranchisement may be less represented in this project, which is already about a topic that is associated with social privilege, and so this is a significant gap.

So, to mitigate this reinforced privilege of information sharing and include some of these underrepresented community viewpoints, I would look at keywords that I noticed were appearing frequently, especially in contexts where social justice and privilege were being discussed by people from different and diverse ethnocultural backgrounds, and would do further internet searches to find highly-shared blog posts, op-eds, or verified accounts that were quoting the original post or saying similar things. An example of a frequent keyword that appeared was intersectionality, a law term referring to "a lens through which you can see where power comes and collides, where it interlocks and intersects"(Crenshaw, 2017) in relation to social identity markers such as gender, race, sexuality, and disability. Searching for alternative published sources sometimes became a good work-around for me, as in the case of Leah Thomas, who started her Instagram account @IntersectionalEnvironmentalist in early June 2020 during the George Floyd-related protests, and so that means that even though it already has 106 000 followers, it is too new to be verified. However, by searching Intersectional

Environmentalism, I discovered she also wrote a blog post for the skincare line Youth to the People, more fully explaining Intersectional Environmentalism as “acknowledging our identities and cultural backgrounds can actually help create a stronger, more inclusive environmental movement [that also addresses] environmental racism and disproportionate environmental hazard risk in BIPOC communities”(Thomas, 2020). Although this specific netnographic case missed out on the visual design and other contextual clues by not including her Instagram account, it gained a fuller explanation of the theory by providing a reason to search more deeply for the term, and was able to incorporate Thomas’s viewpoint respectfully.

3.3 BRINGING IT ALL TOGETHER: SWOT, VERGE, & CONCEPT FAN

Although air travel has reference across many wealthier communities in the Global North, the challenge of reimagining how air travel could shift towards sustainability was helped by uncovering some commonly-held perceptions of air travel by those who actually work in air travel itself and so generally have lived expertise. In order to understand what aviation insiders’ probable expectations were of how their industry generally functioned, it was useful to establish a contextual snapshot of aviation in its pre-COVID form, using a literature review in order to focus on broad and factual information. To do this, I used a SWOT Analysis and sorted widely published and factual information from the context section’s research and also the literature review into Strengths, Weaknesses, Opportunities, and Threats for air travel which, when collected together, allow for a relatively quick but comprehensive overview of the socioeconomic landscape from the point of view of corporate decision-making (Gürel & Tat, 2017) before COVID hit.

However, one of SWOT’s limitations is that “dynamic and structural changes at the level of system, sub-system and supersystem affect the validity of entries in a SWOT Matrix” ((Gürel & Tat, 2017), p.1004) which implies that, as a framework, it is better for understanding somewhat static situations. I was intentionally doing a SWOT for a snapshot of the past, so going into creating it with the understanding that it was already temporally inaccurate was helpful for contextualizing it in the project and to functionally reframe a weakness of the framework as a strength within this project’s context. To

also mitigate and complement this weakness and evolve the analysis derived from SWOT, I used Verge for analyzing the netnographical, interpersonal, and micro-scale impressions of the people using air travel. The Verge framework, developed by Richard Lum and Michele Bowman (Lum, 2014), is a codifying and framing tool made up of six domains of human experience called Define, Relate, Connect, Create, Consume, and Destroy. Since Verge is really meant to bring focus to how people experience the world, it assumes that everything is constantly changing and these six domains can overlap and repeat themselves to reflect simultaneous perspectives. Verge is useful as an extrapolation tool in order to add an element of change-over-time and to reincorporate a humanist element necessary for imagination, so I felt able to focus on the initial reaction to the COVID-19 crisis in this framework and noted how these online communities commonly reacted to the pandemic's effects, as well as integrating some of the context section and systemic factors, and how COVID had impacted their evolution from the SWOT analysis. Infusing micro information with macro systems allowed a refocusing towards peoples' experiences and thoughts of air travel and sustainability, rather than attempting to strategically plan for air travel's recovery in a way that would aim for pre-COVID systems.

Finally, in order to fully expand on this, I took the research question of "how might we reimagine air travel for sustainability, if at all" and plotted some answer ideas and relational thought processes for it in a Concept Fan. A Concept Fan is an extrapolation mapping and problem-solving tool, developed by Edward de Bono to facilitate exploring alternative options within restricted problems (de Bono, 1995). In this study, using the research question as a starting point, the Concept Fan brings together the information from the context, SWOT, and Verge sections and incorporates all of it into a streamlined thinking and problem-solving process which uncovers new insights in the tackling of this question. All together, this methodological process gives a balanced look at both formal industry conceptions and mental models, and informal personal understandings, of both air travel and sustainability, and it also looks at what commonalities and differences will influence the future trajectory and sustainability capacity of air travel and mobility after COVID-19.

CHAPTER 4: ANALYSIS

Considering the reimagination of air travel for sustainability is a potentially massive task, which involves many layers of perspective, consideration, problem-solving, and dialogue from people representing all sorts of interactions with air travel. In this exploratory study, when scanning and gathering data, I noticed that the ways air travel was talked about, what was highlighted, and who the audience was, fell into roughly two broad streams. There is a more formal stream, consisting of information with a systemic perspective from more traditionally established sources, which tends to discuss events, analysis, financials, operations, and initiatives. The other stream is the more casual one and tends to be more about personal experience and perspective, and it consists of cultural semiotics, opinions, influences, and emotions from various voices. While there was some overlap in specific topics between these streams, for the most part the way that air travel and commercial aviation is referred to seems completely disparate. Since any chance of reimagining air travel infrastructure for a successful transition to sustainability will necessarily require multiple perspectives and insights working in mutual understanding, I decided to dive deeper into each stream before attempting to model a synthesis to move forward together.

4.1 LITERATURE REVIEW

The first stream of understanding commercial passenger aviation is the more formal one. This stream consists of articles, press releases, news, and op-eds published on traditional news sites, and often deals with the more tangible, causal, results-oriented, and corporate aspects of the air travel industry. There are some common source areas in this stream, so they are ordered from large systemic entities to smaller entities:

- **Governmental, service, and insight organizations.** These large, national or international organizations each have a role in the functioning of aviation as a global infrastructure, and they often are the authorities for overarching and macro reports. Some of these organizations include the ICAO, concerned with politics, networking, governance and guidance for transport ministries, and best practices for aviation; the IATA which represents airlines, advocates for

economic growth and prospects of the industry, and tracks statistics; the OAG, a data- and analytics-focused organization for the aviation and airport industry; CAPA, for general market intelligence including data, event analysis, and trends; and the ATAG. As these large organizations are concerned with management of air travel from a global or international perspective, they are a great source of overall information and systemic insights.

- A sub-section is **organizations and groups that have a focus on environmental sustainability in transportation**. They include the ICCT, an ICAO-observer organization who conducts research on environmental metrics and factors in transportation with an eye to ecological regeneration and keeping the industry accountable, and country-based organizations like the American EESI (Environmental and Energy Study Institute) which has a similar function except it lobbies the American government. There are also a lot of charities and NGOs who support the use of aviation in relation to social and economic development, such as the ATAG subsidiary Aviation Benefits Beyond Borders, a communications vehicle and content aggregator highlighting the social and environmental benefits and initiatives of air travel.
- **Corporate reports**. These are insight, marketing, or extended press release/package reports about initiatives, concepts, or upcoming trends that the company finds interesting or relevant. For example, Airbus has a report on Sustainable Aviation Fuels, what they could be comprised of, and how Airbus is starting to integrate them into their planes' capabilities (Sustainable Aviation Fuel, n.d.). Another one is KLM & Air France's annual Sustainability Reports, which incorporate economic, green, and social metrics by tracking against the UN Sustainable Development Goals (Sustainability Report 2019, 2020). These reports are useful for demonstrating where they see their customers' questions trending towards, and also are occasionally cited in analysis as well.
 - A sub-section is **Consultancy reports**, which are generated by consultancy or analysis agencies that analyze more broad industry-wide trends toward a corporate audience. An example is McKinsey & Company, who release analysis and insight reports somewhat regularly, including one about a new way for tracking air travel demand post-COVID (Boin et al., 2020)
- **Press Releases**. These are reports sourced directly from companies or governments, and often linked to and reported on in the traditional news outlets and semi-expert blogs (more on

these two sources later!). Often they consist of announcements, updates, new initiatives, and marketing storytelling from the corporation and can be flattering or neutral in tone. Some examples are KLM/Air France being named the top airline in the Dow Jones Sustainability Indices (DJSI) for sustainable practices for the 15th year in a row (*Air France-KLM Sustainability Report 2019 Available Now*, 2020). Another example is one from Air Canada describing how they will discontinue service on domestic regional routes and small airports due to the COVID-19 shock (*Air Canada Discontinues Service on 30 Domestic Regional Routes and Closes Eight Stations in Canada*, 2020) or, similar press releases from SAS and the Government of Sweden a month apart describing recapitalization of SAS in return for increased environmental sustainability but for two different audiences: SAS's release was describing return on investment and continuation of operations, and so was for shareholders and investors (Fischier, 2020), while the Government of Sweden's joint press release from the Ministry of Enterprise & Innovation and the Ministry of Finance was focused on budgetary approval and sustainability conditions that SAS must meet as part of the deal (Khatemi & Färlin, 2020). Corporate social media accounts also belong in this category too as they tend to be quite formal in their tone, and their main functions being generally focused on calm marketing, linking to press releases and other news, and customer service interactions, so they are in essence just short and slightly more interactive press releases.

- **News organizations.** This group contains news reporting companies like BBC, Business Insider, and Forbes. They receive press releases, find scoops, send reporters to events like the Dubai Air Show for industry insiders (Hotten et al., 2019) provide a space for op-eds, link to emergent reports and summarize key points from them, like this Business Insider article about an IATA report on post-COVID recovery (Slotnick, 2020b) and also provide analysis of wider contextual trends or interpretations of what a particular bit of news could mean. They also do the important job of translating occasional obscure or complex terms or concepts into relatively quick summaries, making them accessible to people outside the specific niche. Because of this, news articles and organizations were usually my entrée into a particular path of literature review. Since most news organizations represent a specific country, culture, or industry, this was useful in determining some measure of values from these macro groups.
- **Academia.** The main source of peer-reviewed info and greater analysis within this literature review, academia tends to be focused on other academics as their audience. This means their

articles are not usually written with a corporate audience in mind, even though they and their data is occasionally cited in the corporate world. As an area of formal discussion, critique and info-sharing, and many paywalls, academia tends to interact with the corporate and organizational world more than the more informal cultural stream, especially in analyzing and critiquing events and trends they find in industry. There are some exceptions: for example, The Conversation is a site for academics to write articles about their areas of research in an accessible way, so it becomes halfway between a rigorous academic study and a news organization. For this study, many of the articles I found useful coincidentally turned out to be academic press releases about interesting things people at their institutions were doing, such as the MIT Press highlighting a plane prototype that is propelled without any moving parts through an electroaerodynamic force called ionic wind (Chu, 2018).

- **Pro blogs.** These are websites and content aggregators run by industry people with lots of lived experience. Although blogs tend to be more informal, I'm including this category here because they often strike a similar tone as Press Releases and News Organizations. These blogs are usually written assuming the readers are already somewhat in the know, and the authors tend to be passionate enough about air travel to also write a blog in their own time, so this means I could get a somewhat specific inside scoop into what the industry cares about, talks about, and other inside references. All of this means that they are great insight into how people in air travel actually reflexively conceive of their industry. They blur the line between the formal and casual streams in how they present themselves, since they tend to be reporting on, or giving opinions about, airline press releases or aviation events in alignment with this stream of macro, formal, corporate information sharing. But, they also form and encourage online communities of discourse in their comment section, similar to how much of the casual stream functions.

Overall, the main characteristic of this broad system is that it is focused on tangible events and operations, with its analysis about extrapolations generally constrained to the bounds of the original topic, and its intercommunication is generally a vehicle for disseminating, interlinking, and citing information. This makes sense as the air travel industry in general is very results-focused and has lots of processes of streamlined, efficient, and evidence-based decision-making. The grand majority of paywalled sites were in this stream, indicating that they consider true value to be in the knowledge, data,

and insights contained within. Trawling for information gave me overall systematic context and trends of air travel data, great analysis and pragmatic insights from people who are focused on tangible results and consequences, and a perspective of what topics and values are consistently important across the whole air travel industry and how the industry in general approaches problem-solving and innovation.

4.2 CONCEPTIONS THE AIR TRAVEL INDUSTRY HAS OF ITSELF

In COVID times, air travel is facing an uncertain future. However, even before a surprise global pandemic, air travel was unique in its positionality of being both essential and vulnerable, and facilitatory and bureaucratic all at the same time. Using the data collected from all of the sources in the more formal, info-sharing stream as well as much of the information from the “Context” section above, some common, underlying, and systemic aspects of how and why air travel functions the way it did pre-COVID were uncovered. Although the COVID-era info sources were not included directly, they were useful in indicating how air travel was before COVID precisely because the grand majority of the information was focused on details of how COVID changed the industry. This allows a back-inference both in this case and also in understanding how people in the industry thought of their industry.

As aviation is very concerned with tangibility and results, the overall overarching sense I got from exploring this stream is of ‘getting complex things done well’. This focus serves the air travel industry well, as the primary function of this industry is quite basic: to safely transport people from place to place, and in this function it has become a very useful system to many people and entities around the world. This simple facilitatory *raison d’être* becomes complicated in the second order of effects, such as flying between two international places which requires prior coordination between the places to build adequate landing infrastructure, and thus requiring international standardization so as to be as safe as possible without as much political influence. Aviation’s basic purpose causes complications in its logical precursors as well: for example, a consistent and internationally available supply of standardized fuel is first required before an airplane’s turbofan can be invented, much less placed onto about 200 000 aircraft all flying at once during the highest day of plane traffic according to Flight Radar 24 (Satherley, 2018)

4.2.1 SOME COMMON THEMES

In practical terms, air travel is an industry that has spawned other support industries and is also a necessary component in other, non-aviation-focused industries as well. This means that the people, organizations, and companies who share, analyze, and opine on air travel come from diverse backgrounds of context and expertise, so triangulating any shared and different mental models of air travel is a useful exercise. This is done through noticing patterns in which info is shared, how it is framed, and which is linked to other info, and this allows for a contextual snapshot of the purpose air travel sees itself fulfilling, its values, its struggles and how it approaches them, and generally how it as an industry sees itself. Here are some common uncovered themes.

- **Engineering Marvels:** in this stream, the excitement over the technology of aircraft is shown through highlighting new technological innovations, like Virgin Galactic's new supersonic prototype (A. Boyle, 2020) and comparing statistics like distance capacity and fuel efficiency. Public failures are so unusual in the air travel world that they are endlessly analyzed and become a reference or case study, like the series of Boeing 737Max crashes that had multiple angles and factors analyzed and discussed to see what went wrong and the aftereffects at Boeing (Hawkins, 2019); however the catch-22 for my analytical purposes is that these crashes tend to be very dramatic, which helps get wide news coverage and reactions, since the target market for news coverage isn't necessarily just industry insiders but the general public as well. This theme contains the presupposition that airplanes are the only common practical vehicle to traverse oceans, mountain ranges, polar ice caps, or deserts, and it also contains a lot of tempered awe at the smart people who can invent and innovate on these aircrafts. I am placing this presupposition within this theme because flight is so engrained in the assumptions of many writers about systemic factors that it doesn't have to be mentioned, whereas alternatives to flight are specifically called out – an example is Elaine Glusac's New York Times article comparing train and plane experiences from Chicago to St. Louis, where she spends the first three paragraphs assuming the reader would be incredulous that she would choose ground transportation (Glusac, 2019).
- **Customer experience:** this theme was gathered from a wide variety of articles sharing specifics of new experience or customer service initiatives, or alternatively, consistent problems with the experience of flying. The experiences reported on can be throughout the whole

journey of flying, so some examples include airport experience, like when Hong Kong pro-democracy protestors blocked access to the International Airport (McCarthy et al., 2019), involvement in sustainability initiatives and “what you can do” articles involving eating vanilla cups instead of throwing them out (Bernabe, 2020), to what new sanitation and security measures could be part of travel post-COVID including UV booths (Ormiston, 2020), to exploring perks and offerings including particularly creative or odd ones, like Emirates paying for their passengers’ funerals if they contract COVID-19 on their flight (Dan, 2020). Another aspect is of ignoring customer experience, as in Addepalli et al’s paper tracking growth factors for civil aviation and including a reference to airplane manufacturers considering social demographics as irrelevant (Addepalli et al., 2018). A common story theme is of people doing something bizarre on a plane or in an airport and being escorted out, causing delays but usually no more damage than an entertaining story. A presupposition that many airlines subtly reference is that being on an airplane can feel like a liminal place between two concrete places, so this allows them to create special ideas for their customer service offerings.

- **Operational facilitation:** this includes news about route offerings, like Southwest’s use of route structure to adapt to crises like the B737 Max crashes (Russell, 2020), changes in ticket pricing structure (Escobari et al., 2018), and the structures supported by air travel like the tourism so many developing countries awkwardly rely on (Baum, 2019), references to economic aspects that rely on airplanes and also compete with them like Google and Uber (Engel, 2018) and other logistically-focused notes. This theme has a lot of cause-and-effect, and presupposes a consistent iteration for improvement in many processes that air travel runs and operates in.
- **Financial structures:** this theme is a common one in the business world and especially because air travel is a notoriously tough business to be in, money-wise, with Investopedia calling the industry “synonymous with ongoing losses and insolvency” (Staff, 2019). Common trends include quarterly gains or losses, government interventions or bailouts, bankruptcies like the sudden demise of the famous Thomas Cook (Ludden, 2019), mergers, perks and frequent flyer plan updates, and trends in types of passenger demand, such as an airline opening a no-frills sub-brand.
- **Organizational management:** this theme follows corporate structure changes, employee number changes, strategic decisions on the part of the company or entity, and organizational reports, including the releasing of financial statements and investor relational statements which

is also in line with the previous theme of Financial Structures. One story was about Boeing's CEO switch after the B737 Max crashes, and of how the new CEO was faring or presenting himself (Kitroeff & Gelles, 2020). This theme also follows the decisions of larger governmental organizations, such as the political maneuvering of getting carbon taxes passed through a government.

4.2.2 SWOT MATRIX

To get a better understanding of how the entirety of this complex and diverse macro system fit together, and how people with air travel industry expertise think of it fitting together, I plotted these points and Context section learnings in a SWOT matrix, in order to outline the industry's internal strengths and weaknesses, and external or emergent opportunities and threats. For clarity's sake, I have sorted the points within the SWOT by their above theme. Remember, this is a pre-COVID snapshot, so as to understand the lingering conception of air travel in the more formal systemic spheres. The SWOT table is over the next two pages.

Strengths	Weaknesses
<p><i>Engineering</i></p> <ul style="list-style-type: none"> • can fly far, fast, and over tough terrain • culture of innovation • culture of safety engenders trust • deep field of personal expertise • lots of inter-competition keeps the innovation sharp <p><i>Customer experience</i></p> <ul style="list-style-type: none"> • flying can be an aspirational experience • liminal place gives airlines freedom to experiment with offerings • je-ne-sais-quoi associated with frequent flyers <p><i>Operational facilitation</i></p> <ul style="list-style-type: none"> • results-based focus means lots of iteration and adaptation • planes can go almost anywhere, allowing for almost endless strategic reiteration <p><i>Financial structure</i></p> <ul style="list-style-type: none"> • reliance on premium class to subsidize economy class increases ticket accessibility • growing market due to emergent middle classes in high-population places like China & India • once caught, market is captive: path-dependency of aviation as a facilitation means expectations of its existence and difficult to imagine life without it • main competition is with other airlines <p><i>Organizational management</i></p> <ul style="list-style-type: none"> • many international governance organizations in place • established culture of focusing on dropping fuel efficiency 	<p><i>Engineering</i></p> <ul style="list-style-type: none"> • crashes get bad quickly • long lead time on aircraft due to complicatedness, design, certification, and expense of creating a new one • current engine and fuel tech generates emissions <p><i>Customer experience</i></p> <ul style="list-style-type: none"> • current experience reputation is dependent on price of seat, with a few airline exceptions • economy class is widely disliked • greenwashing (Kurheg, 2019) <p><i>Operational facilitation</i></p> <ul style="list-style-type: none"> • high start-up costs to interact with air travel: e.g. building ground infrastructure, starting businesses • high risk / high reward of new routes (Denby, 2019) <p><i>Financial structure</i></p> <ul style="list-style-type: none"> • lots of inter-competition leaves too much focus on financial structures and nickel-and-diming approach to finances • corporate stock buybacks give more value to shareholders and short-term spending and leave businesses vulnerable to financial shocks (Alsin, 2020) • expensive and financially fragile industry <p><i>Organizational management</i></p> <ul style="list-style-type: none"> • governance: ICAO voting structure non-functional, and creating a system wherein transport ministries oversee their own climate accountability is dysfunctional (ter Kuile, A., personal communication, August 7, 2020) • bad tracking of passengers through limited market stratification and purpose of trip

Opportunities	Threats
<p>Engineering</p> <ul style="list-style-type: none"> hydrogen fuel cells or hybrid planes SAFs Decoupling emissions from passenger growth (Newby in (Morris, 2020)) Circular economy usage of old plane materials <p>Customer experience</p> <ul style="list-style-type: none"> education on green initiatives code-sharing with fast surface transportation like KLM/AF & Thalys wifi & device integration as digital tech improves <p>Operational facilitation</p> <ul style="list-style-type: none"> deprioritize finances and prioritize sustainability metrics in order to track efficacy of impact <p>Financial structure</p> <ul style="list-style-type: none"> financial vulnerability to external shocks mean that it is a good canary in the coal mine for non-aviation predictors and analysts <p>Organizational management</p> <ul style="list-style-type: none"> creation of case studies by airlines and industry demonstrating efficacy and financial viability of being sustainable, e.g. KLM/AF winning DJSI again people holding airlines accountable 	<p>Engineering</p> <ul style="list-style-type: none"> price of expertise and price of planes communications technology updating super quickly and outpacing modern tech clean tech not being integrated fast enough to mitigate climate crisis; reliance on oil right now means air travel brings the crisis closer with each flight vulnerability to increased climate-change-caused natural disasters like hurricanes, or volcanic eruptions (Gabbatiss, 2018) <p>Customer experience</p> <ul style="list-style-type: none"> passengers behaving badly flight crew behaving badly and being filmed, as in the viral video of Dr. David Dao being dragged off of a United flight (Kessler, 2019) not understanding sociocultural contexts enough, committing a faux-pas, and being “cancelled” (<i>Words We’re Watching: What It Means to Get “Canceled,”</i> n.d.) <p>Operational facilitation</p> <ul style="list-style-type: none"> Amazon / drone delivery Netflix, VR, other digital experiences trade wars between Boeing and Airbus using their respective governments as leverage (Shalal & Hefher, 2020) <p>Financial structure</p> <ul style="list-style-type: none"> individual airlines in certain areas like the USA might have some trouble with increasing inequality of their customer bases government corruption and bribes part of ticket price and huge part of airline cost structure is controlled by price of oil <p>Organizational management</p> <ul style="list-style-type: none"> the CEO as the ‘face’ of the company in times when it’s easy to be cancelled (see above) means some vulnerability to constant changes in leadership

Table 1: SWOT Analysis for air travel before COVID, organized with internal Strengths and Weaknesses on top and external Opportunities and Threats on the bottom.

For air travel, its strengths mostly lie in its engineering prowess and deep field of expertise in that sense, and also its social entrenchment as an infrastructure, relied upon by billions of wealthy people and many industries all using planes to do what they want to do and get where they want to be. However, notwithstanding its somewhat captive customer base, many of its weaknesses are financial and many of its threats are environmentally-related. These two areas are connected in part because planes are uniquely vulnerable to many of the environmental shifts that are starting to emerge due to

global warming-induced climate change. Global warming and climate change are directly contributing to factors that jeopardize aviation's customer base and therefore its financial health in at least two major ways: firstly, by contributing to factors that create instability, like pandemics or sea level rise, and secondly by exacerbating global socioeconomic inequality (Worland, 2019), which means offerings could become more financially unpredictable for the airline. This indicates that aviation is existing in increasingly paradoxical circumstances, wherein its operations to ensure its continuity in one sense actually increase its vulnerability. In a financial sense, aviation's dependence on fossil fuels is also paradoxical, as the high operating cost of burning fuel encourages both fuel and financial efficiency, but the financial savings also disincentivize innovation on fuel or engine structure towards ecological cleanliness. Knowing that a supply of oil is finite, the reliance on it seems unusual, especially paired with the idea that each flight contributes more emissions to the atmosphere and thus hastens the climate crisis closer. The flow of these paradoxes means that the SWOT analysis should actually be read like this:

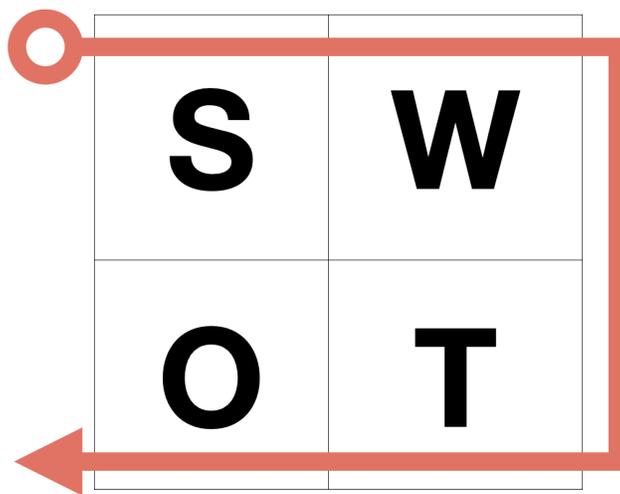


Figure 2: SWOT Analysis reading guide.

Placing the Weaknesses and Threats in this sequence highlights the current relation between them, and then implies an opportunity space for air travel to imagine a way out of its paradoxes. With the discovery of this ongoing paradox, alongside the emergent COVID-19 pandemic paradox mentioned in the Intro section, the conceptual opportunity space brought on by the COVID shock might be sorely needed as the stakes for air travel seem suddenly very high.

4.2.3 COMPETING FLIGHT PATHS FOR CLIMATE AND ECONOMICS

This paradoxical circumstance that air travel increasingly finds itself in is due in part to its own entrenchment in a numbers-based status quo, in relation to amount of money it makes, number of passengers it serves, amount of demand and cargo, and other measurements (*Airlines Financial Monitor, May-June 2020, 2020*). This means that, for the air travel industry and especially for airlines and airplane manufacturers, it seems like they find it difficult to fully integrate more holistic considerations into strategic decision-making since numbers seem more tangible and more widely shared. This might in part be why air travel does have some initiatives to support sustainability and regeneration, since changes in climate in many places of the world is measured in specific numbers and causal changes. However, the numbers produced by measuring the environment that tell the story of climate change work on a different kind of system than the numbers produced by measuring the functioning of air travel, in that the numbers of climate change could be pointing towards increased chaos (University of Copenhagen, 2010). This is the complete opposite of the numbers tracking a business or service, since those are more geared for, and used for, confirming predictability and reigning chaos back in to normative expectations. Notwithstanding that climate change numbers and measurements are demonstrating increased specific unpredictability, some tangible results of climate change directly threaten aviation, since they involve threats to physical infrastructure like airports at sea level, routes near glaciated volcanoes, or less chances of dodging hurricanes. The tangible results of climate change also affects the holistic interpersonal systems that air travel relies on, since aspects like sudden migration, pandemics, and destruction caused by natural disasters impinge on air travel's previously reliable captive market, as shown in stark detail by COVID-19.

4.3 ANALYSIS OF NETNOGRAPHY

Air travel is such an enduring cultural icon or reference in the Western world and a somewhat common experience in North America, with 87% of the 2000 Americans who responded to a Victorinox-sponsored survey in 2017 saying they had taken a plane at least once in their life (Wood, 2018). This means that there are online worlds and communities of practice (and commiseration) talking about

various aspects of aviation. Using the assumption that most people interact with, share, or post content that resonates with them somehow, netnographic scanning revealed loose categorizations of communities of people who share similar interests and/or experiences relating to air travel. There are often overlaps between these communities, as shown by inter-liking on social media, inter-sharing, and inter-referencing. Due to the subject matter and the inherent privilege associated with both using a plane and commenting freely about one's travel plans, and by dint of being the most vocal about air travel, these communities tend to be lead or extreme users of air travel. This means they tend to represent a slightly more biased view, one that airlines and industry people most likely hear more as well, and one the industry intentionally seeks out and tracks through their marketing and system. I couldn't gain access or be a fly on the digital wall in all communities without permission, for example communities of employees and more vulnerable groups like immigrants or refugees tend to be more private, and finding and qualifying people who don't post about planes because they don't interact with them was practically impossible as they were essentially invisible. I should note that this is a gap in this research and not an indicator that they do not exist in significant sentiment and numbers, and these people also fall into a big gap in how airlines and the air travel industry observe and track their passengers as well. However, here are some communities that do interact with air travel that I found and have affectionately named based on some common characteristics.

- **Pilots.** Some online communities include forums PPRuNe (the Professional Pilots Rumour Network), AirlinePilotForums.com, Reddit's subreddit r/Flying, and also pop up in relevant threads on Reddit as well. Overall they share a relatively unique experience, are used to being experts, and tend to discuss and share the feeling of flying specific aircraft, often in comparison to each other. One commonly-repeated or referred-to story of an extreme pilot experience is the SR-71 Blackbird speed check by Major Brian Schul (Blackbird Historian, n.d.) wherein he and his crew member Walt overhear three successive pilots in different planes show off to each other about how much faster they are over Air Traffic Control centre radio, and then he and Walt proceed to obliterate everyone else's speed with the SR-71 Blackbird, one of the fastest planes to exist. While commercial passenger air travel doesn't use speed planes since the Concorde, this story still shows the general pride in the calm professionalism pilots present, and also shows the camaraderie, competitive nature, and hands-on aspects of the job as well.

During COVID, many of them have been (understandably) worried for their industry and are hoping that things can get back to something that resembles pre-COVID times soon.

- **Travel Influencers.** These social media monarchs exist mostly on apps that have a strong visual component, such as Instagram, TikTok, and SnapChat, and some posts can get highlighted in culture-focused sites like BuzzFeed or Vulture. They tap into the aspirational reputation of travel in a bunch of different ways: through country-counting, experiencing-chasing, or targeting a specific aesthetic or niche. All of this is to achieve paired goals of enjoying travel experiences and gaining social clout, and maybe even celebrity, through followers, likes, and interactions with the goal of being sponsored for posts. Being associated with the aspirational nature of long or frequent travel, or similarly being associated with the health benefits from taking active or relaxing vacations in beautiful or unusual places, allows for marketing and brand promotion as well. An example of this is Murad Osmann, who posted a shot in St. Petersburg, Russia, on Instagram sponsored by Honor Global batteries on July 2 (Osmann, 2020); other common sponsors include apparel companies or tourism departments. Many travel or lifestyle influencers see social media influencing as a vehicle to promote or sharing ideas or values: an example is Jessica Nabongo of @thecatchmeifyoucan on Instagram, who advocates for more Black people in the travel and tourism spaces and has created a community in her comments by asking and answering questions dealing with topics like responsible storytelling (*Jessica Nabongo on Instagram, 2019*) Travel Influencers are often armed with a camera, a ring light, a consistent aesthetic, and an eye on secretive algorithm maximization, and so have adapted to COVID by going quiet, pivoting to general lifestyle or fashion content, or travelling locally, but generally with a wistful air of waiting for international travel to be accessible again.
 - A sub-niche to this community is the **Pragmatic Professionals**: including journalists like Neil Shea (@neilshea13), filmmakers like Jimmy Chin (@jimmychin), outdoorspeople like Adrian Ballinger (@adrianballinger), artists like Renan Ozturk (@renan_ozturk) and story-sharing accounts like Jedidiah Jenkins (@jedidiahjenkins). All usernames are for Instagram. For this group, frequent travel is a means to an end, but this doesn't mean they're not going to document the trip for their followers as well.
- **Plane Geeks.** These are people who love the engineering of specific aircraft, have a memory associated with flying, appreciate a specific airline, or are otherwise fascinated by air travel.

There is a lot of overlap here with the Pilot community but Plane Geeks don't always have piloting experience, they just really like aviation and collect memorabilia, camp out near airports to plane-spot, or memorize lots of specific facts like airport codes (Jetson, 2020). Depending on what kind of geekdom they share, they might watch & comment on Youtube under channels like Wendover Productions or Mustard, meet on Facebook's Aviation Humor group, read sites like pilot Ken Hoke's AeroSavvy blog, read military plane news aggregators like The Aviation Geek Club, volunteer to write articles for Captain Jetson's general insider news site, or hold pilgrimages to see their favourite planes: some widely beloved aircraft include the SR-71 Blackbird – see above story under Pilots community, and also Elon Musk and Grimes naming their son in part after the A-12 Archangel plane (Boucher, 2020). Others include Concorde via ClubConcorde, and recently, the 747. Geeks can turn an aircraft into a legend through collecting memorabilia and sharing facts and stories focused on their aircraft of choice. During COVID, they are mourning or leaning hard into nostalgia.

- A similar community to this one is **Security Nerds**: armchair experts on global defense but on a more superficial scale, this community likes to debate on the best kinds of airport security. Activating in similar places as Plane Geeks and Business Analysts, they also meet on forums like FlyerTalk. In general they dislike the American TSA and see the organization as incompetent, but they like Israel's Tel Aviv airport security (see comments under (Schlappig, 2017)) notwithstanding a key and public part of Israeli security is racial profiling. During COVID they have focused more on debating politics and cybersecurity.
- **Corporate Frequent Flyers**. Also can include people who work for non-corporate jobs that travel frequently on their organization's dime, so they are time-sensitive and overworked but not price-sensitive. These people outwardly portray flying as a necessary and annoyingly frequent part of their jobs, even though I think many secretly love it. A community with lots of ironic, self-deprecating and blasé humour, they tend to commiserate over annoyances from security to jet lag to just always feeling uprooted. Some online communities can be found on social media, such as the Instagram meme page Crazy Management Consultants, on blogs like Your Mileage May Vary, or on online forums or comment sections for websites like FlyerTalk. They bond over shared common experiences and idiosyncrasies of flying, rather than enthusiasm, and chasing and maintaining frequent flyer status reinforces a wish to escape bad experiences

while also indicating there is some chasing of tacit social importance as well. During COVID, they have shifted to speculation on the success of airline sanitization measures and have also started complaining about virtual meetings instead, especially video call faux-pas or unnecessary meetings-that-could-have-been-emails.

- **Eco-activists.** These people are very focused on education or awareness-raising for the climate, sometimes in relation to advocating for their audience personally adopting personal discipline, reacting and commenting on events, or organizing collective action like meetings or organizations or protests or group lobbying. Having a large amount of younger people represented, this group tends to communicate through Instagram, Twitter, blogs, and more traditional news channels with press releases and conferences. Since this group is focused on knowledge-sharing and advocating for ideas and change, there are a lot of academics in this group as well who tend to share their thoughts on places like The Conversation & by interacting with individual people on Twitter. During COVID, there has been lots of activity and op-eds due to quarantine & civil rights movements, and some common themes include both praising the carbon emissions drop caused by lockdowns and admonishing that it isn't enough, highlighting COVID as an example of quick collective and government action in response to a crisis, and merging intentionally with civil rights issues by highlighting BIPOC environmental experts like Dr. Ayana Elizabeth Johnson (@ayanaeliza on both Instagram and Twitter). As a group that is generally declared leftist, Eco-Activists have been wading into political storms and being vocally disappointed with their governments' failures of eco-protection or active destruction thereof.
- **Cheap Adventurers.** Similar to Travel Influencers but generally nonprofessional and much less performative, this group is very price-sensitive in that they are bargain-hunters for experiences. Their online community action is usually about searching out and comparing different avenues, platforms, websites, airlines, techniques, and routes in order to score a deal before it goes away. This has led to competition between online flight search vehicles like Kayak, Skyscanner, and Google Flights. Often this group has personal loyalty to specific websites, networks, or techniques that have worked for them or that they have heard about through word-of-mouth, which gives people who are consistently good at finding cheap flights an almost mythical reputation. Occasionally, this has led to repeating circumstances for some of these people, who have gone on to found their own travel agencies or businesses dedicated to finding bargains, such as Scott's Cheap Flights, founded by Scott Keyes in 2015 after his informal mail

list to friends and family got too big (Scott's Cheap Flights, 2020). Cheap Adventurers see themselves as somewhat under-the-radar, and so most online communities tend to be on email lists or other more private avenues, or following specific accounts like SecretFlying on Twitter. Evidence of their habits can be found on websites that have tracking for popularity on their content, such as blogs like Thrifty Nomads and hyper-localized groups like the Facebook group YZY Deals. At the beginning of COVID, some jokes were shared about the riskiness of flying on very cheap airplane fares at the beginning of the travel bans, such as a meme featuring Tom Holland looking askance over his shoulder in a plane with the caption "me after hearing someone cough on my \$8 round trip to Italy"(2020b). As the lockdowns have continued to drag on or also started to lighten up, the references and blog posts have localized or dissipated.

- A sub-group is **The Eagerly Informed**, who are aligned with the Cheap Adventurers on wanting to be very in the know. They focus on travel tips, either in a generic experiential sense or in a specific niche sense like The Points Guy examining how to maximize credit card rewards for free flights, and because of this they tend to be much more broad and public with their info sharing strategies than the Cheap Adventurers. These people can be found following and sharing on insider info blogs like View From the Wing, and public blogs like Travel Update.
- **Business Analysts.** This global group of interested, confident, and fast-moving people are curious about airlines' fleet acquisitions, upgrades, downgrades, mergers, partnerships, and incentives from a business and financial sense. Online they can be found collecting and writing on news sites like Forbes, Business Insider, OilPrice.com, and Fast Company, as well as following specific people on Twitter and LinkedIn. They seem to be mostly focused on understanding the economic implications of these events, networking through frequent interlinking or inter-referencing in comments and articles, and just like to be kept up to date. During COVID, they have been carrying on as usual in reporting, analyzing, and giving hot takes on airline struggles.
- **Conspiracy Theorists.** As a massive infrastructure and globalized system, aviation seems like a prime target for people who generally distrust massive global institutions. However, especially for flat earthers, air travel is a means to an end, which is to prove that the world is flat. For example, a common 'test' is booking a window seat and bringing a spirit level tool onto planes, in order to shoot a video showing the level seemingly matching the horizon at cruising

altitude to prove the flatness of the earth (Harris, 2020). Flat earth conspiracy theorists congregate on Reddit, on online forums like the Flat Earth Society and their equivalent Facebook page, and in large numbers on Youtube where they post playlists, comment, and share each others' videos. Since there can be a lot of overlap between flat earthers and other conspiracy theorists like QAnon, during COVID, much of the focus has been on non-aviation-related theories. I'm not sure how they relate to air travel moving forward into sustainability, but as a major online group of groups they tend to be represented in a small way in almost every other online community that I was observing.

- Irrelevant to air travel specifically, but relevant to sustainability, is a small but vocal minority of **Climate Deniers**: people who either intentionally or unintentionally ignore climate science news and/or think that climate change is fake. Some possible reasons why people might deny climate change's existence include: that it's too overwhelming or intangible, it is more convenient for their life or business functioning to not have to deal with climate change; or they think that global warming will actually help people. This conspiracy theory has been funded and supported by millions of dollars per year in lobbying efforts by oil and gas corporations (Maslin, 2019). Climate deniers seem to be generally aligned, either politically or morally, with **Anti-Maskers**, who vocally protest against wearing a mask during the pandemic. However since the anti-mask movement is new and more simplistic, climate deniers seem to have more sustained influence at the systemic level as well as the interpersonal level.

4.3.1 HOW PEOPLE ARE TALKING ABOUT THINGS, AND WHAT THIS MEANS FOR THE AIR TRAVEL INDUSTRY

Aggregating the amassed netnographic scan into broad personas and cross-referencing their reaction to events allows for an uncovering of commonalities and differences in their reactions, and looking at which online communities are talking about which event and in what way allows for some degree of certainty in determining extrapolations for the future and directions for solving this study's research question. For example: sanitization measures on airplanes flying post-COVID, such as blocking off the middle seats, are generally agreed to be a good thing, but different communities have different takes on it: Cheap Adventurers are hesitant to fly due to potentially paying extra to keep middle

seats open, while the Eagerly Informed are hesitant to fly at all (see comments underneath article written by (Cortez, 2020)). However, Business Analysts are sharing a study that shows that keeping the middle seat blocked much reduces the COVID-19 transmission risk depending on what one uses to measure the risk (Ray, 2020), and some Corporate Frequent Flyers are taking the opportunity presented by this study to shame airlines that have been booking middle seats for unrelated poor overall travel experiences in the past as well (Meek, 2020). Looking at all these together, it is clear that the word-of-mouth of how airlines deal with COVID will be a direct impact on their brands, and this means that the optics of trustworthiness in relation to their social responsibility, in this case demonstrated by dedication to sanitary measures, will be an important strategic consideration for airlines in their recovery post-COVID. It also demonstrates how these various lead and extreme users project their values onto air travel, and this allows a chance for extrapolating how they might react and continue to adapt to other aspects of the post-COVID world.

In relation to sustainability, the Eco-Activists tend to be quite impatient with the slow pace of change in the air travel industry and will gather together to protest any air travel-related thing. Occasionally these protests are successful, such as the sustained protest and campaign that caused a planned third runway at London Heathrow to be scrapped due to a court ruling that climate had not been considered enough (Picheta, 2020). In envisioning a more ecologically-friendly future, they often talk more about their large-scale goals rather than how to achieve them, instead focusing on the moral imperative to adapt to regenerate. The Travel Influencers tend to pay lip service to sustainability when sponsored by an eco-friendly company or after an event like the Australian wildfires in January, 2020, but unless they cross over with the Eco-Activist group, that's about as far as they go. The Eagerly Informed have created listicles for what travellers can do to minimize their flight carbon footprint, the Business Analysts are curious about case studies and how to make sustainability work in a financial sense, the Corporate Frequent Flyers make ironic and dark jokes about the end of the world anyway and share the website Is2020Over.com (if you were wondering, the answer is No (Ismail, 2020)), and the Plane Geeks and Pilots aren't really talking about sustainability at all.

Taken in aggregate, this implies that sustainability is generally not top-of-mind or the most pressing issue that most of these communities chat about, although it is generally on radar and seems like climate change is just an accepted fact of life at this point for the people who are most represented within these groups. This means that, in relation to the relative apathy of their clientele, air travel most

likely will not have any significant change in demand due to social concerns about sustainability in the next few years, with the exception of some places and airlines in Europe, which means that the pressure to adapt towards sustainability won't come from the general public, at least in the near future. However, the legal backing of climate activism in opposition to air travel growth in Heathrow implies that there is a race between airlines' ability to sustainably adapt, and the general public's increasing climate knowledge and activism, which are most likely to jump even more when the effects of climate change start appearing. This means that the kind of incremental change that the air travel industry has been doing is a really excellent start, but might not be fast enough for when the effects of the climate change paradox really start tangibly impinging on its functioning, which then means that the COVID-19 shock actually presents a good opportunity for companies and governance organizations to get a head start in steering the slow ship towards reimagining and refocusing on sustainability before any climate crisis hits its customer base.

CHAPTER 5: FINDINGS

5.1 VERGE FOR COVID-ERA TRAVEL

Discovering impacts and implications for the air travel industry in relation to its lead users is even more relevant in the time when the world is reeling from the COVID shock, since they almost embody one of air travel's paradoxes: they are the ones who most likely make up air travel's core customer base and so, in a pandemic, are also more likely to be spreaders of disease and industry instability. Since COVID is without doubt the most widespread shock to hit the air travel industry and the industry was unprepared for a shock of this scale (ter Kuile, A., personal correspondence, August 7, 2020), previous shocks have been smaller and more manageable so there isn't much historically with which to compare COVID. So, Verge allows a sense of the direction of evolution in the sociopolitical contexts and changing attitudes leading towards the future. I am using Verge to map the most commonly posted conversation topics from online communities in the early stages of the COVID-19 lockdown. This isn't always specifically about air travel, since the general references to air travel seemed to conceive of the industry as people remembered it in pre-COVID times, and the only real difference is in framing, from excitement or performative indifference, to nostalgia or longing for air travel to start up again or noting with sadness various aspects of the COVID fallout. This could also be due to people reacting and mourning to their suddenly changed circumstances. However, gleaning common trends in how people reacted to COVID lockdowns could have an impact on how they conceive of air travel and what they might require of it going forward, and so this allows Verge act as a foil to the SWOT above and to uncover a fourth-dimensional element of change-over-time. Here I incorporate the COVID-19 shock into an analytical category: since most peoples' conceptions of themselves and how they work are similar to pre-COVID, similar to the air industry's conception of what is normal operations, using COVID as an inflection point and plotting out how people reacted to the lockdown allow for a stress-test on both streams. Since people's conceptions of air travel have historically been either reactions to their own experiences flying or generally dictated by what the air travel industry offers as a possibility, industry context has an effect on what and how people talk about air travel, and so this Verge chart focuses on interpersonal conversation but infuses elements from the

context and literature review sections. This means that this Verge chart is generally focusing on the perspective of the people in the system and the relationships between people and the system as well.

5.1.1 COVID: A BOLT FROM THE BLUE

In the early reactions to COVID lockdowns and the ways that people were talking about their lives, the most common overarching themes uncovered were figuring out how to adapt and move forward under the new quarantine lockdown restrictions, a nostalgia or longing for the pre-COVID times, and a sense of patience, frozenness, or stasis in during the lockdown until the resumption of 'normal life'. In the first few weeks and months, there was a collective sense of discomfort and grief (Berinato, 2020), as everyone mourned their cancelled plans, past understanding and sense of predictability in the world, and sense of control over their own life as macro forces seemed to take over. Some commonly discussed factors that seemed overwhelming because they were out of the person's individual control include: the pandemic, dealing with newly imposed rules for life like teaching their kids who aren't in school, working from home or being deemed an essential worker so putting their health at risk by going to work, often to jobs with low pay and low occupational prestige (Reeves & Van Drie, 2020), agreement or disagreement with political handling of the pandemic health crisis, emotional support for their community members, economic stresses like losing jobs and deciding if rent can be paid or not, and judging other peoples' ways of dealing with their uprooted lives as well. In the Verge graph, this confusion and constant adaptation is mirrored through the fact that the most populated and inter-linked categories are Destroy – Define – Relate – Connect, which reflects the emergent nature of the COVID-19 fallout and how people were very quickly trying to redefine their normal routines and processes.

How people started dealing with the pandemic-caused uncertainty is through another set of common themes: because many of the social interaction spaces moved online and the online world is geared for information-sharing, there was much more attention and dedicated sharing action for information, movements, and opinions, leading to the viral spread of news about the Hong Kong protests, George Floyd murder and spread of civil rights action, and constant updates about new scientific studies or new guidelines for the coronavirus. Another theme is online etiquette rules becoming more widely established, to the point of viral examples of faux-pas or mishaps in the backgrounds of video chats and particularly creative Zoom virtual backgrounds were shared. Another

theme is of people going to nature to escape their houses or their more urban homebases – since getting outside while physically distanced was encouraged as a safe way to recreate while maintaining quarantine safety, and in lieu of traveling on a scary airplane or to some other potentially unsafe indoor place, one of the standard Instagram photos from Influencers became of a camping trip or a walk in the park. Another theme is fear of large crowds, which also matches fear of being in places that are designed for interconnection, so this means fear of public transportation, which directly means fear of airplanes, buses, and trains. This fear translates to people who are wealthy enough to use their own private small vehicles, whether it be bikes, cars, or private planes. Those who don't have access to private transportation but still need to be transported either bulk up on masks, gloves, and hand sanitizer, or just take their chances unprotected. The people who were stuck at home also turned to DIY projects, like making sourdough (Hickman, 2020), sewing one's own mask, or taking care of plants (Slaughter, 2020) which all became jokes on the internet through many communities like Influencers, Frequent Flyers, and Eco-Activists. These examples all show subtle shifts in demonstrating perceptions of social value and acting on it, and is noteworthy since it comes in the absence of the value signaling that, before COVID lockdowns would have often been demonstrated with a travel post.

5.1.2 THE VERGE WHEEL

Verge is about tracing systems of value in a larger holistic system, with the circular categories being Define, Relate, Connect, Create, Consume, and Destroy. Define refers to ways that we define ourselves and the world around us, such as paradigms, and attitudes. Relate refers to organizations and ways to organize people, such as business models. Connect refers to things like language and urban design that connect us and other people or things. Create refers to the processes and tech through which we produce goods and services, like efficiency. Consume refers to the way that we acquire and consume things of value, like customer preferences. Destroy includes the ways that we destroy things of value or how value is in and of itself destroyed, such as waste and undermining rules and norms (Lum, 2014). Since the Verge categories flow in a cycle, they are shown in a wheel-like shape. Some trends may have an effect in another category, so light grey dotted arrows are used to show connections across trends. This chart will also be in the Appendix A in a full-page version, and in a greyscale version in Appendix D.

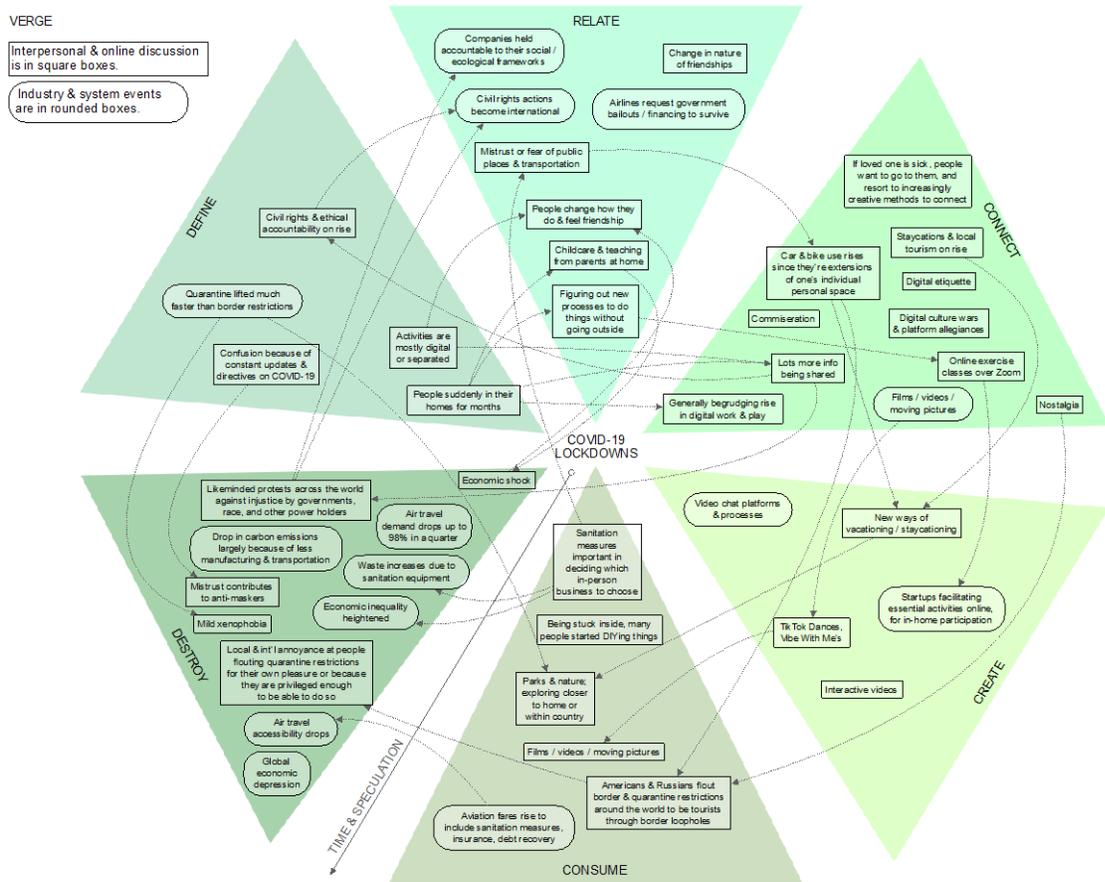


Figure 3: Verge, for people in lockdown post-COVID

Infusing some systemic reactions to COVID alongside the interpersonal reactions using Verge was both difficult and telling, in that since Verge tracks flow of value, it shows how value is conceived of differently in both systemic and interpersonal streams. On the broad systemic level, value is in events and results; in the individual personal level it's in experiences and relationships. This means that, although there are nodes of interconnection through either stream that impact the other, for the most part both streams have different interpolations and effects since their values influence the trajectory of any changes over time. This and the sheer size of the players in each stream meant that the people in the micro stream were able to be much more agile in their reactions as individual, wealthy entities and smaller communities than the bigger systems in the macro stream, as shown by their reactions flowing post-Destroy and Define into Relate, Connect, and even Consume. Looking at the Verge wheel from a top-down level, the contrast is also shown through a majority of grey industry boxes in Verge being in Destroy, since post-COVID they no longer hold the value that they once did, or at the farther end of

Relate as they enact emergency measures like bailouts that are beyond their usual operational expectations.

One other thing of note is that the smaller, informal stream is comprised of people who experience and talk about a more holistic and relational perspective of events, and so the people are more likely to have its events impacted by events and aspects of the larger system than the other way around. In this study I found two exceptions to this trend, where a system reacted to a micro-level initiative, which were: people being stuck in their homes for months needing to figure out how to do things without going outside which led to a huge rise in the ecosystem of startups facilitating essential activities online. The second one is when peoples' lockdown-induced increased rate of information-sharing led to likeminded protests across the world and civil action going viral, the movement of which attempted to induce systemic change by keeping systemic-level entities accountable for their social positionality through formal channels like their company webpage blogs (Mitchell et al., 2020). Triangulating how sustainability fits into both streams is influenced by the values held in each stream as well.

In the larger systemic stream, environmental considerations tend to be acted on as a responsibility, in relation to a conception of holding power as well, and are very practical in terms of iterating on tangible objects and looking for quantitatively measurable results, like the number of passengers per kilometer of fuel burnt (2018). In the interpersonal stream, environmental considerations are thought of more in relation to individual choices like the Influencers eating vegetarian food and posting about it, annoyance that more isn't being done by large entities that are perceived as holding power, like the government or multinational companies, or even complaining about the weather – in short, it's an underlying concern for many people but not a big, immediate, or urgent one, or maybe the primary value in mentioning it on social media is virtue-signalling. This is reflected in the lack of major themes about sustainability derived from the netnographic data, even as people became accustomed to new quarantined routines and alongside social activism's rise during lockdown.

5.1.3 SUSTAINABILITY ACCOUNTABILITY IS UP IN THE AIR

This lack of major online community discourse on sustainability, paired with the measurements of fuel efficiency and references to sustainability initiatives from news reports and press releases, implies that the most progress and impact towards environmentally-directed adaptations and changes is actually being achieved at the higher, macro, industrial level. This makes some sense since the company and industrial level of international hierarchy generically tends to be where the most emissions come from and are supported by (Taylor & Watts, 2019), but having people emotionally outsource responsibility for the ecological health of the planet to other, larger, and more powerful entities who are responsible for the emissions in the first place is an environment ripe for lack of accountability – especially if another major accountability entity, the ICAO, has a governance and responsibility structure which is recursive upon itself and therefore vulnerable, especially in relation to sustainability.

The sustainability-related implications of the effects of COVID on the air travel industry are therefore both positive and negative: positive, since it force-paused the planes and created a stiff stress test that is causing some systematic changes for the better in response, such as cleaning house of inefficient planes, having financially unhealthy or excess airlines disappear with the result of industry contraction and less planes in the sky at first, and also creating some structural precedents for environmental accountability of airlines to their governments and people. Also, negative, since the financial stress of the 98% drop in demand and sustained low levels after the fact means that, in an industry that is already so focused on economics, some ecological projects were among the first to be cut and most likely sustainability projects will be majorly deprioritized in the future as airlines and other businesses feel like they are unaffordable as they try to recover financially from the COVID shock. This then means that these incentive structures for companies to deprioritize sustainability at this moment in time inadvertently contribute to both paradoxes the whole industry is facing: both the paradoxical relationship their industry currently has with climate change which is referenced in the above SWOT section, and the interconnected nature of the world as facilitated by air travel which also facilitates pandemic shocks as referenced in the Intro section. This implies that airlines and other companies are both emitters but also the main entities keeping themselves sustainably accountable, which is also allowed to happen to emitting companies in general through the lack of accountability that its users are imposing on the industry, as shown through people's general apathy shown in online social discourse. The general wider apathy on the part of the lead or extreme airplane user communities is a feeder into

both of these air travel paradoxes, as these communities most likely tacitly encourage air travel's speedy (financial) recovery to support their own personal experiences and facilitated ease of life, and the emergent paradoxes seem invisible or somewhat irrelevant to their goals.

5.2 CONCEPT FANS

So, then, how do we use the online social discourse analysis to help drive a reimagination of air travel sustainability?

The Concept Fan is a framework designed by Edward de Bono to be able to approach a problem in a different way if all other obvious solutions have been discarded, through looking at orders of scale of a problem and tracing causality and potential solutions forwards (de Bono, 1995). This can also mean exploring solutions to complex problems wherein there are somewhat strict parameters or many things have already been tried before, which I was somewhat fortunate to have happen for this study by discovering many really interesting and occasionally wild innovations that industry players are doing. In order to more fully extrapolate on how to use the COVID-19 shock to help reimagine air travel for sustainability, my first attempt was to find potential solutions to the research question of this project, which is (as a reminder): how might we reimagine air travel for sustainability, if at all? I first started leaning into the idea that people react to systematic events, as demonstrated by post-COVID-19 lockdown reactions. To provide more synthesis from the Verge and to make sure I am covering as wide of a spread of concepts as possible, I have arranged the six Verge categories underneath the fan as a way to classify and sort the concepts, and plotted the concepts heading Left to Right in a series of stacked ideas leading towards potential solutions. This inclusion of Verge means that it doesn't look like a classic symmetrical fan arranged along a horizontal plane, but that the placement of each concept is more telling. In order to honour the problem-solving origin of Concept Fan, I've also included questions were generated during the making of this framework that I extrapolated off of in coral-coloured boxes. This visual will also be in the Appendix B if you would like a full-page version, and a greyscale version in Appendix D.

CONCEPT FAN

Questions are in rounded coral boxes with dashed arrows.

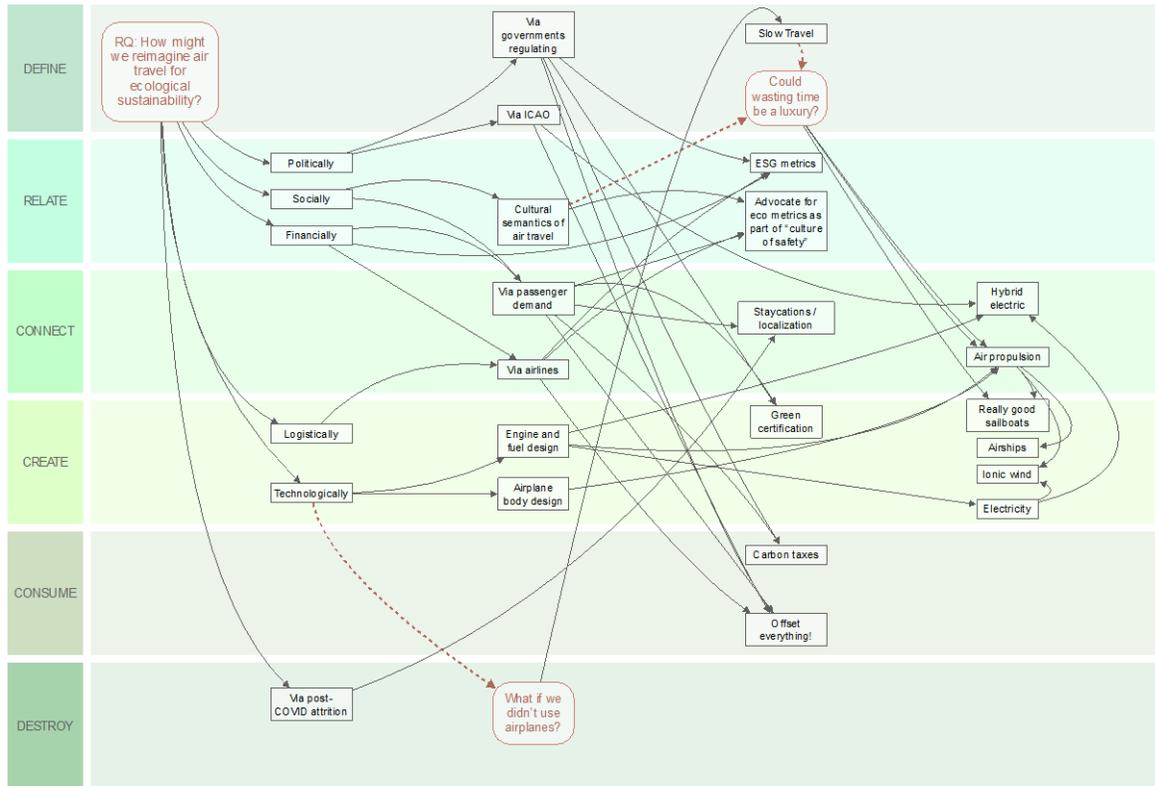


Figure 4: Concept Fan #1 - Reimagining air travel for sustainability

This exercise gave some useful levers for adapting the air travel industry to sustainability, and was helpful for understanding future options that pragmatically flow from current events. In relation to what the SWOT analysis showed, it was actually very similar to how the air travel industry and its incredibly intelligent people have been progressing forward with sustainability-related measures for the past few decades. However, it was difficult to integrate anything outside of what I learned from the straightforward and process-oriented literature review and context sections, and this also didn't seem to genuinely answer the research question. In hindsight, this makes sense as the Verge had shown that the macro and micro streams had two very different value systems and ways of activating this value. So, in light of the other revelation exposed by Verge that most of air travel's lead or extreme users don't talk about or care about the environment all that much, I realized that the part of the original research question of "reimagining for sustainability" as an interpersonally-generated activity could no longer get

off the ground. To fix this vulnerability, I have used the Concept Fan technique of zooming back an order of magnitude to see if there is another problem that is more accurate to tackle and would contribute to better solutions. So, this second iteration of Concept Fan is about “How do we get people to care more about ecological sustainability?” Although this is a broad statement brushing over the very wide spectrum that people and cultures are on in relation to caring and acting for the environment, I mean it to refer to the overall global trend of capitalist ecological deprioritization as well as for air travel’s lead users. Activating on this question will expose new ideas and strategies to move forward with reimagining air travel for sustainability as well.

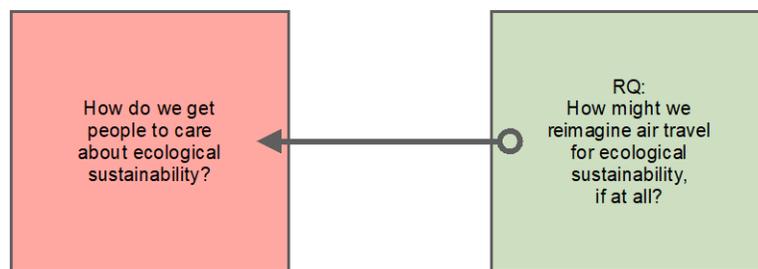


Figure 5: The backwards shift to start a new Concept Fan.

In this next Concept Fan, my goal is to get the concepts and problem-solving to a point wherein the original research question can be included at the end, or towards the right-hand side on the diagram. Essentially I am curious about how to fill in the space between the original research question and my new pre-question for this second Concept Fan. I am including the research question as a bigger box in this second Concept Fan to indicate that this is where the first Concept Fan can start fitting in and a genuine reimagining process for air travel’s ecological sustainability can begin. I also used the pink question boxes to indicate a potential problem with the train of thought and usually put these problems in the ‘Destroy’ row to preserve possibilities of problem-solving off of them. This concept fan will also be in the Appendix C in a larger version, and/or greyscale version in Appendix D.

CONCEPT FAN #2

Questions are in rounded coral boxes with dashed arrows.

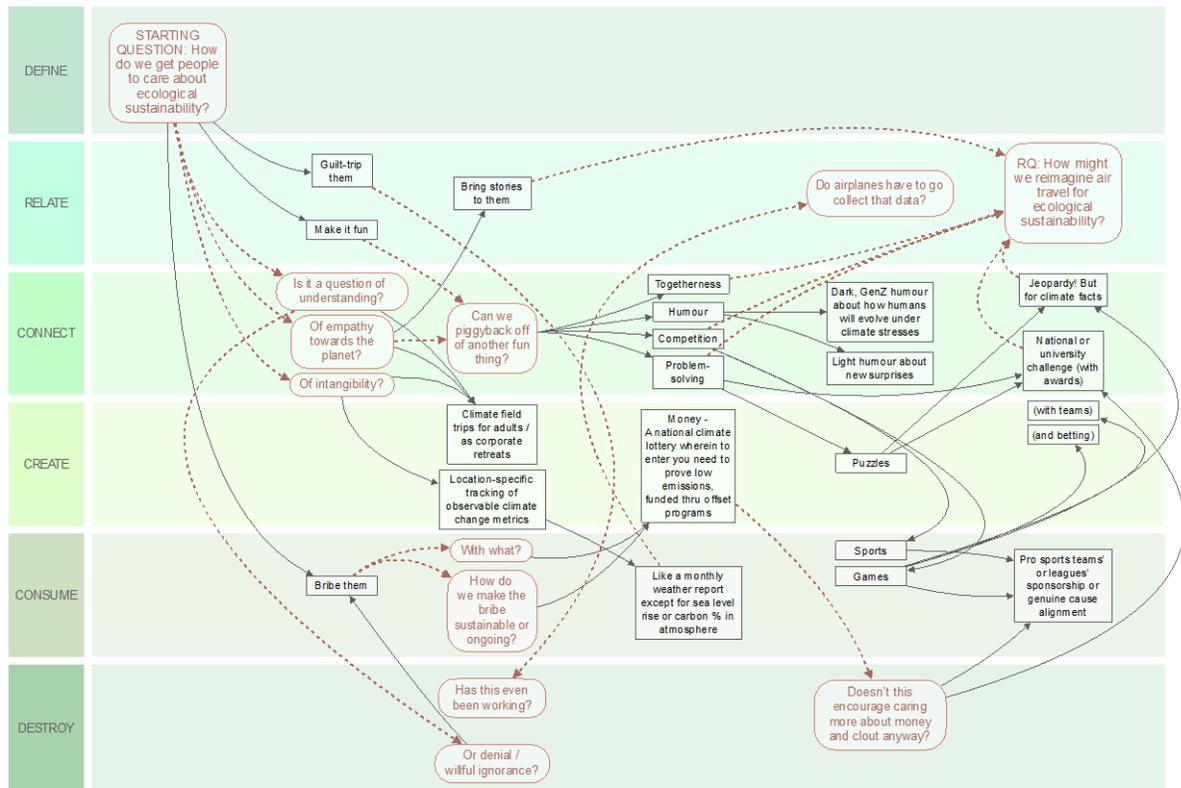


Figure 6: Concept Fan #2 - For finding solutions to climate apathy post-COVID.

The first thing that this Concept Fan modification makes clear is that ecological friendliness takes second fiddle to economic and experiential concerns. This is shown by the areas of leverage with the most traction being economic or fun-related, like bribing, or friendly competition. This entire fan also implies that, if left unattended, interpersonal and individual processes are not likely to prioritize climate action, potentially because it is a concept that is just too big for our brains to empathize with in any tangible way (Walsh, 2019), or potentially because of its nature being increasing unpredictability on longer timelines that makes it difficult to intrinsically feel the flow of the changes. This means that the ideas with the most potential success are the ones that allow people to feel like they have control in this huge existential crisis that is climate change, like bringing in storytelling, climate-related entertainment media, or awards like climate lotteries or problem-solving awards. Improving the relationship that lead and extreme users of air travel have, as people, with climate change, will hopefully mean that they

would be more willing to use their tacit power to help contribute to creating a direction for sustainable accountability for the air travel industry.

5.3 DISCUSSION

This study started out as an exploratory foray into how air travel could be reimagined for sustainability, through looking at how people think of air travel both inside and outside the industry, and how much they care or mention sustainability as well. I learned that, in general, the air travel industry is talking about emissions and sustainability much more than their frequent passengers, and both the industry and smaller communities have voices within them who are relatively strong pro-climate in relation to their milieus. However, even though many people are generally quiet about climate-change-related things, air travel tends to have a reputation for being ecologically unfriendly, and especially among those people who are vocal in caring about the climate. This mismatch between actions being taken and ecological reputation could be due to a few things: the slow speed at which air travel iterates and improves upon itself relative to a person's perception of time, the slow speed at which air travel iterates as a symbol of how most currently-existing infrastructures in privileged places are adapting too slow for climate crisis mitigation, a comparison piece between the vocal eco-activist and the more sustainably-minded airlines wherein the eco-activist finds the airline lacking for consideration or effort, or a general frustration on the part of the eco-activists at the capitalistic status quo of big companies deprioritizing ecological concerns. If the latter, then perhaps the people who care about sustainability may be sensing a difference between some airlines' narrative of ecological sustainability and the actual mechanism behind the business and industry: shown by the avoidance of SAFs and cancellation of E-Fan-X for financial reasons, airlines switching out older models for new aircraft that both "provide their passengers with better experiences and relief for their bottom lines"(Pallini, 2020), and the increase in fees and discomfort in economy classes ostensibly, as Frontier Airlines describes it, for lessening plane weight but with a convenient parallel to the airline saving money through discounting on amenities (Kurheg, 2019). All of these seem to imply an incomplete and incohesive ecological strategy, as well as a concurrent willingness to use sustainability initiatives as a marketing tool.

5.3.1 THE OPTICS OF ECONOMICS

While the air travel industry refers to safety, innovation and finances in equal measure, the eco-activists seem to have the most problem with the highlighting of finances, and in this they are joined by many other communities of people as well who feel like they haven't gotten value for the ticket price in their experience. However, if the actual mechanism behind the global air travel business is based on financial tracking, then this demonstrates a disconnect between people and industry and even different levels of the industry in general, since for many island or terrain-locked places air travel can be an incredibly useful public service. While the small airliners that service islands or spaced-out small communities might be budget airlines like Lion Air, or subsidized through programs like the USA's Essential Air Services (Curran, 2020), the bigger jets that fly unsubsidized might be seen as unkind or as creating a barrier to access for everything else that air travel can facilitate by charging an elevated price.

Also, when ticket or trip price is discussed in online communities, it is often about how it is too high, and one of the most popular travel blog topics by far is sharing tips on how to avoid paying full ticket price through increasingly arcane methods like maximizing points from specific credit cards (Kelly, 2020). This current of frugality runs in opposition to the air travel industry's desire to make money for itself, even if to pay off the debts incurred by high operating costs and paying off or leasing their planes (Ros, 2018). While this back-and-forth is normal and basic capitalistic game strategy wherein all players want to make money and also give away as little as possible, the fact that the people in these online communities are often referencing price when complaining about air travel experiences implies that we are all stuck in this capitalistic status-quo too.

Another potential angle is the fact that this price debate surrounding air travel, an infrastructure that often functions as a public transportation service, can feel disingenuous, since many local airlines in areas like the archipelago countries in Southeast Asia seem to have figured out how to create low-cost and functional airlines, and also other, less costly public transportation services can be highly subsidized for accessibility or even cost savings from removing the payment infrastructure (Hess, 2020). Although I haven't been able to find an airline that has tried this payment-free route, its usage for public transport infrastructure implies some scalability for bigger infrastructures as well.

Another angle for the price debate might be that it's also a marketing or communication problem, since the fact that airline ticket prices are actually incredibly low for their labour and service value is hidden from public perception, in part because it isn't widely reported on but aspects like quarterly returns are. Taking a pragmatic view at the world and approaching environmental sustainability with an eye for metrics and results is good for genuinely supporting the environment, since the environment shows and doesn't tell, but the consistent illustration of financial prioritization for most airlines and air travel companies and supporting governments implies that the ecological aspects of this industry would necessarily fall second fiddle to finances. Extrapolating this forward past the COVID-19 shock implies that the financial stress the industry is under will also set it back sustainably for these reasons.

5.3.2 CIVIL RIGHTS X CIVIL AVIATION

Another difference in dialogue between online social communities and formal industry is that online, there is a lot of talk about social justice, equity and inclusion, while in many air-travel-related areas there is very little mention of any civil rights initiatives, except for in direct response to events like protests and movements, and it is often communicated via more informal and direct channels like social media or as a post on the company website. This disconnect has the potential to alienate many members of the online community, or is also an opportunity for some businesses like Delta to gain clout over others like United after United's string of unfortunate passenger mishaps in the past five or so years. As an aside, the focus of civil rights initiatives in North America to be holding companies accountable for diversity might work better with a more nuanced take to aviation, where gender prejudice is a stronger problem (Enelow-Snyder, 2019). However, notwithstanding the focus, there is often a tacit separation between environmental and social corporate action in that an initiative is often implied to be one or the other, not both at once. The argument for intersectional environmentalism argues that, because vulnerable people around the world tend to bear the brunt of climate change's negative effects, there should be an explicit merging of both social justice and climate justice action, so the emergence of this social movement could be a good opportunity for the industry to address both its climate paradox and also align with public opinion focused on civil rights.

5.3.3 THE ROLE OF A KEEN PUBLIC IN SUSTAINABILITY

If there was more climate urgency, the ability of many systems to flow in the direction of sustainability would be much faster, as shown by greener airlines usually coming out of greener countries. It is possible that many people don't care about climate change as much because it's too abstract, overwhelming, or intangible to them and because our brains aren't designed for considering the far future as equally as the present. However, the idea of being able to travel to a different place, on an established, safe, functional and predictable infrastructure seems like a concept that is easy to grasp for many people, as shown by the fact that it is now an expectation that this infrastructure will exist and almost subconsciously relied on in places like southern Canada, the coasts of the USA, eastern Asia & south east Asia, central Iran, Saudi Arabia, Australia, and western Europe (*Busiest Routes 2020*, 2020) and many others. My brother decided to move to Paris partially because he had the subconscious expectation that he would be able to come back over to Canada and have people be able to visit him, as "a key part of [why he moved] although not consciously factored into the decision. On the flip side... the draw of living in Europe is precisely that I don't have to use air travel as much to visit friends in other countries or experience new cultures. I think in general if air travel didn't exist, then it would be a lot harder to move there, so things like my working holiday visa wouldn't be worth doing" (Kingston, R., personal correspondence, August 6, 2020). As a culture, because air travel has done so much for us, we believe it to be a critical and non-negotiable infrastructure such that having it be harmful and having it exist is still better than it not existing, and a threat so existential and consistent to airplanes and air travel as climate change mitigation could also seem like a threat to the criticality of the infrastructure it provides as our brains reduce the complexity into what it deems relevant for the present. In a future study, looking in depth to social attitudes and conceptions about sustainability actions, climate change in relation to human experiences, and the interaction of people with their infrastructure could be useful complements, especially doing deep Causal Layered Analyses (Inayatullah, 1998) might help uncover points of understanding and levers of change to (respectfully) induce caring about climate onto people. This might help understanding of how air travel became so essential and culturally entrenched as well.

5.3.4 LEVERS TO INFLUENCE CHANGE

For the minority of people who already care, being a vocal minority within capitalistic societies, advocating for an entity that is everywhere in human experience yet needs interpreters to translate its signals, and having trouble feeling like they are being taken seriously when warning about a crisis all contribute to a sense of frustration. Helping more people care about climate change and take part in activism would both give more power to the movement and also make the original activists feel better. While there are a number of different ways that could work in helping other people to care about climate, some air travel-specific measures that might be helpful in contributing to greater climate consciousness include:

- A certification with measurement guidelines for airlines and air travel businesses aiming to be green, beyond airlines independently searching out designations like 'carbon-neutral', similar to Organic for food.
- Leaning into the idea of air travel as a public service, and then nationalizing private airlines or turning them into NGOs so as to circumvent the focus on profit as the main metric of success. This might also have the side-effect of slimming down the industry, which would have a positive climate effect as well.
- Being inspired by the frameworks created by civil rights movements and using them for intersectional environmentalist reasons in order to hold corporations, governments, and large entities accountable to larger climate and social ethics and inclusion paradigms.

Within air travel, the question around sustainability becomes if the entire industry and governance structures as a whole can adapt fast enough for climate purposes. Aviation's speed, ease, and price accessibility is so entrenched in the Western world's social systems and so is unlikely to be compromised by most people who have access to it in any year where travel is less restricted. This means that some lever points would have to be intentional and aimed at creating a social tipping point for generating a majority on the side of sustainability. Some of these levers that might help induce regenerative practices on air travel could be:

- **Financial.** Looking long-term, like in the tradition of air travel business, there are many incentive points to pull airlines and airplane and engine makers towards sustainability. They are already working on iterating the technology and some initial investments are being made

into it, like KLM's capacity-building SAF plant (*KLM, SkyNRG and SHV Energy Announce Project First European Plant for Sustainable Aviation Fuel*, 2019), and the electric prototype Alice by Eviation already has orders from Cape Air (Boatman, 2019) – being one of the first major players in the sustainable air travel industry and having a controlling stake in future capacity is a good way to make money in the future. In relation to the financial aspects of fuel costs, fuel efficiency is already a focus of the industry, but the fluctuating cost and somewhat unpredictable amount of supply of oil is a good incentive to start finding other, more stable fuel sources that also don't require refueling and its associated costs. In the financial world, BlackRock Investments has made sustainability a key feature of the projects they invest in (BlackRock's Global Executive Committee, 2020) and as a bellwether for the investment industry it is assumed others have started doing the same. Also, ESG (Economic, Social, & Green) financial measurements are a good way to follow KLM and start tracking progress.

- **Political.** Since air travel is such a regulation-heavy industry, there is a lot of political power here to affect change. Primarily, aviation tends to still have tax exemptions left over from when it was a fledgling industry in order to support its initial growth and existence (ter Kuile, A., personal correspondence, July 24, 2020). Removing these will cause airlines to incorporate the extra cost into their ticket prices, which will surely cause ticket prices to go up. Many people are quite price-sensitive, and if there are any fluctuations in ticket prices, especially if they consistently rise post-COVID, the people who have been conditioned for pre-COVID-level prices and already paid these 2019 fares begrudgingly might be priced out altogether, causing demand to go down. Another political initiative that might have the same effect is carbon taxation or making carbon offsets mandatory, although these run the risk of making price-sensitive people who don't care about the environment be annoyed at sustainability practices. If an airline isn't owned by the government, they are most likely beholden to shareholders, so the government could wait for the next financial shock in this ever-sensitive industry and become a shareholder, thus gaining more control and leverage as well. This tactic was recently used by the Danish and Swedish governments on SAS to ask them to decrease their carbon emissions by 25% five years faster than originally planned (Khatemi & Färin, 2020). Even if the airline needs a loan, the government can use this as leverage for sustainability measures, as was the case with the French government asking Air France to cut domestic flights in exchange for coronavirus relief in order to aim to become, as French Finance Minister Bruno Le Maire

said, “the most environmentally respectful airline” (“Air France ‘Must Cut Domestic Flights to Get Aid,’” 2020). Also, the political trade wars between airplane manufacturing places like the USA and UK featuring Boeing and Airbus could cause more incentive for each company to innovate faster than the other one. On the international end, sadly ICAO acts as a reflection of global attitudes rather than a lever to change them, but the ATAG is trying to be a force for change by combining powerful industry and regulatory players and setting them collectively against issues like climate change.

- **Social.** Last in this list for the recency effect – although this category was generally hiding under the collective consideration radar before COVID, the pandemic restrictions have shown how much the air travel industry relies on a consistent demand from passengers, so any large-scale consistent drop in demand could have an impact. One of the most cohesive movements encouraging this is flygskåm, which could be an emergent threat in the progressive Western world if air travel can’t become green as a whole system. Some businesses recognize the importance of communicating their sustainability practices, but occasionally these initiatives are lightweight on impact, such as the E-Fan-X hybrid project, leaving the companies vulnerable to social accusations of greenwashing. Greenwashing refers to marketing or doing small, non-impactful side projects, in order to make a business seem more sustainably-minded than they actually are. Although greenwashing is frustrating to those in the eco-activism community, its existence should be partially encouraging as it demonstrates that the company recognizes a demand for sustainable practices, and also it provides a clearer opportunity to hold them accountable. A third way to keep private businesses accountable is through their shareholders as mentioned above. If an airline is publicly owned, activating the influence channels of that particular government via options like voting, lobbying, social capital, or fundraising in order to request that transportation be sustainable might be effective. The key to most social leverage is that it be collective, since the numbers of passengers or shareholders or citizens demanding sustainability is good for metrics-based or optics-based entities, and key to moving it up the company or government priority list.
- One other consideration under the social lever is that, if we as the world have to go into a future scenario of years of discipline to maintain the climate or heal the planet, the question of who would be allowed access to air travel and who would be heavily restricted would have to be carefully considered and answered. Under COVID-19, formal exceptions to lockdowns were

made for people in “essential services” including healthcare workers, grocery store and pharmacy workers, sensitive financial services, maintenance workers, and transportation people. Currently the people who fly often for utilitarian reasons or for their jobs are a diverse range including salespeople, diplomats, movie stars and crew, consultants, troubleshooters for international organizations, tour guides, influencers, and NGO workers. What a country or organization deems “essential” as a job is up to their values, but most likely diplomats, troubleshooters (and potentially NGO workers) could be some of the few people allowed to fly due to the inherently global and interpersonal nature of their work, and having this restriction might create a stronger global association of air travel with privilege.

- **Technological.** Due to the slow pace of technological change that is involved in designing and creating an aircraft, a clean engine being invented and can be easily swapped onto existing planes, this would be one of the silver bullets to make it relatively easy for the air travel industry to adapt for sustainability. The increasing inclusion of heavy or complex machinery like atmospheric scrubbers might also be a push to technologically innovate faster.

Post-COVID air travel actually has a great opportunity for reimagination and generating resilience for itself through sustainability measures. Not only is climate change creating an emerging paradox for air travel, but the opportunity for aviation to be an industry leader in sustainability practices has good grounding in some of its current practices and cultural modes of thinking. While COVID-19 is a traumatic shock to the industry and to those of us under lockdown, it also has a silver lining: by putting a pause on the dynamism of the air travel industry and forcing the industry and people who travel to reevaluate and cope without travelling, this stress test allows for what is considered important about air travel to rise to the top in both streams. Some specific opportunities for air travel to start leveraging for itself include the fact that, in aggregate, road vehicles contribute way more to transportation’s overall direct greenhouse gas emissions than aviation does, in a ratio of 72.6% of road vehicles vs. 10.62% for both domestic and international aviation ((Sims et al., 2014), p. 606), so even though rail travel is better ecologically, air travel has a great PR opportunity to rebrand itself as consistently aiming for sustainability in comparison. Also, airplane technology is well-positioned to adapt innovation from almost all other transportation vehicles in order to get the best of the best. Some other points of leverage that air travel can use to its advantage include a culture of safety which begets a general trust and assumption of functionality on the part of the people who use it, and there is also a generally

captive market for air travel, which this means that for the airlines and air travel entities that do survive COVID-19, there will be an established landing place.

CHAPTER 6: CONCLUSION

6.1 SUMMARY OF THE PROJECT & CONCLUSIONS

This project started out on an airplane trip from Toronto to Paris, flying to visit my brother who had recently moved there. En route, I was curious as to how I could continue to see him without hugely increasing my carbon footprint, and I was curious if anyone else was wondering the same thing. Thus became this exploratory look into adapting air travel for ecological sustainability and how people considered or thought about this goal. The sudden advent of the COVID-19 pandemic during this trip caused a break in routine and showed itself as an inflection point in the future of social relationships between people and their infrastructure, so this led to the research question of this project: how might we reimagine air travel for sustainability, if at all?

This research question has two parts: the first is “for sustainability”, which, because the environment’s health is measured in data points, is necessarily a results-based process and so is scientific, measured, and carefully considered. Since the air travel industry tends to be very results-based as well, I see it as falling under this aspect. The other is “reimagination”, which is a human or personal impetus and is emotional, creative, and based in a relational understanding of the world. Having both of these aspects is important in any attempt to adapt a human system like air travel for ecological friendliness, since excluding the human element from the system designed by and for people will cause the sustainability process to be non-functional, and excluding the environment will mean that the process is worthless. This means it was necessary to include and infuse both in this project, and since air travel is the only really feasible method for long-distance travel, this led to the overall goal becoming using the social discourse to discover necessary factors in adapting air travel for ecological sustainability. As there are many other infrastructures that need adapting, air travel can be seen as a case study.

Some avenues I explored first were tech adaptations and international systems of governance. However, I realized that in order to truly be able to understand or even have access to some of these fields, I would need declared expertise like engineering, diplomacy or economics. So, working off of the assumption that the general milieu that air travel operated in would have an influence on the industry,

this project focused on the sociocultural contexts of air travel in relation to its main customer bases, the somewhat privileged general public of the world of which I am a member. This assumption was validated in part by the COVID-19 pandemic, which demonstrated in sharp relief how much air travel relies on its passenger demand for survival.

The COVID-19 pandemic also illustrates one of two major paradoxes that air travel is increasingly entering into. The most tangible one is the one the SARS-CoV-2 virus took advantage of: an increasingly globalized and interconnected world brings both positive and negative things easier and quicker to people living in separate places. The virus continent-hopped in the respiratory systems of travelers visiting their family for the Lunar New Year holiday, visiting different countries and major cities for business, or traveling to beautiful parts of the world for tourism. This clear link between travel and the coronavirus being spread caused international travel restrictions and border closures, and a resultant swan dive of air travel demand by about 98%. As more pandemics are expected because of both habitat loss and global warming, the interconnectedness of the world facilitated by air travel is likely to create traumatic future shocks to the air travel industry itself.

The other major paradox that air travel increasingly faces is that of climate change itself. Airplanes burn kerosene to function, which causes greenhouse gases to be released into the high atmosphere and this causes global warming which causes climate change. The effects of climate change include many things that are starting to tangibly, directly, and negatively affect air travel's continued functioning, such as the aforementioned risk of pandemics, and also including stronger and more unpredictable storms, sea level rise impacting airports, and more volcanoes erupting as their heavy glaciers melt. This means that, by doing its daily operations, air travel is contributing to conditions that will negatively impact its own survival as an industry and the service it provides to the billions who use it every year. All of this is to demonstrate that, for air travel, the stakes of being eco-friendly are actually very high.

To explore this suddenly fraught and dynamic topic, I took a bi-pronged approach to studying the social discourses surrounding air travel before and after COVID-19 hit. Coincidentally my data collection uncovered two broad but generally disparate "streams" of information flow and value that matched the project's research question's double-barrelled aspects. The first is industry-based news and opinions, which tended to be more formal, events-focused, and macro in scope and vision. This

stream values tangibility, numbers, causality, and results. The second stream was discovered through a netnographic observation of online communities of lead and extreme users of air travel, but it was much more interpersonal, informal, and emotional, and from the perspective of individual people so micro in scope. This stream values ideas, resonance, tacit semiotics, and empathy. The values and communication mismatch illustrate a larger problem of adapting air travel to be sustainable, in that already the two streams are not in the synchronicity required to effectively solve the research question.

To analyse the data collected, I decided to use tools relevant to each stream. For the formal industry and system data, I took inspiration from business tools and used a SWOT analysis. Plotting out the various internal and external positive and negative aspects of air travel in relation to both its passengers and sustainability uncovered the climate change paradox, and it also uncovered that, in regards to fuel efficiency being both environmentally-friendly and cost effective, that airlines have been doing a lot of sustainability-related initiatives behind the scenes for decades. However it also revealed that the main way the industry was adapting was in incremental improvements iterated on over time, and that the international system of governance tacitly encouraged this slow pace of change through giving responsibility for the continued climate accountability for airlines to national transport ministries through a dysfunctional voting system as well as prioritizing safety of its system. The SWOT also revealed that the main two ways the industry measures its success is through safety and financials, which implies these are its areas of operational prioritization as well. While the focus on safety helps contribute to air travel's social value as a trusted infrastructure, the focus on financial growth is a consistent challenge with both its public interface and its ability to really prioritize ecologically-friendly opportunities over cheaper but more destructive ones.

Because the main conception most people inside and outside the industry have of air travel is of what it was like pre-COVID, the SWOT is focused on this. This is also in part because the trauma that COVID-19 caused to the industry is so wide-ranging that its effects are only starting to emerge. However, the reactions on a personal level were illuminating when tracked on Verge, a humanist foresight tool that categorized value change over time as people experience it. Using the COVID-19 lockdowns as an inflection point and tracking how people dealt with and talked about their limited mobility revealed new routines and processes that people were building for themselves that were also replacing the personal needs that air travel facilitated. It also revealed through various levels of success of various social movements that people tend to really care about their own experiences, and

also they care about other people, but they use environmental friendliness more for social value performance rather than activating on what it actually means to solve this problem. This means that there is very little genuine will to compromise one's own goals, lifestyle, and reliant infrastructure to achieve the level of eco-friendliness required to avert the increasing climate crisis.

Verge also revealed that the macro-systemic group of entities adapts much slower to events than the individual people or small communities. However, COVID-19 was a shock to both the macro and micro entities, so it was a surprise that using a concept fan to answer the research question revealed similar change trajectories as had already been described in the earlier SWOT. So, I took a step back in magnitude from the research question to determine how to make the public, as represented by these online lead and extreme users, to care about climate change and want to act with urgency. Working through this problem's potential solutions was uncovered as the first step to genuinely reimagining air travel for sustainability in a practical and long-lasting, human-supported way.

The final conclusions from this study are this: for the air travel industry, the kind of gradual incremental improvements over time have added up to sustainable-esque successes; however, based on the predicted climate timeline, these efforts are not moving fast enough to avert other climate catastrophes nor build industry resilience for other upcoming shocks. This necessary reprioritization for climate urgency is also hampered by a general lack of will or sincere caring on the part of the potential passengers for air travel, upon which air travel depends as shown so starkly by COVID-19. Also, we are all stuck in a capitalist status-quo wherein picturing ourselves in commercial frameworks is easier than moving towards enacting ecological frameworks. This leads to some potential ideas of how to induce caring towards people or force faster change upon the air industry, which are mostly focused on reducing demand for air travel through price changes and by investing in capacity for green processes.

6.2 CONTRIBUTIONS

Taking a look at the specific area of the social discourse surrounding air travel and ecological sustainability, especially as impacted by COVID-19, generated some contributions that might be useful to some fields.

Firstly, this study's attempt at tracking differences between formal reporting and informal, interpersonal communication and attempting to reconcile them towards a specific purpose is useful for moving forward in ecological friendliness. As climate change is a global problem, all of us will be affected in some way, and understanding and uncovering our differences in value and how these assumptions are communicated is useful for activating a cohesive action. Moreover, using air travel and the changes brought by COVID-19 as common experiences, showing the disconnects between formal and informal communication streams about the same topic allows for a translation between both streams so as to more ably unify them for better mutual understanding.

Secondly, merging Verge and Concept Fan with elements of both frameworks in each other is useful for a reimagination or futures exercise within a field that already has strong expectations and boundaries that may not be explicitly described. In order to do this, it is important to first uncover what the boundaries are for a particular field or area of inquiry, and so doing the SWOT first was key to the next two frameworks' successful infusion. In this particular study, both air travel and how people considered air travel have described roles to play to interact with each other, such as a passenger buying a ticket for a plane ride in accordance with their price comfort and the airline transporting them to their destination via a seat class with a specified level of amenity provided. However, both air travel industry insiders and people who interact with air travel have unwritten boundaries they follow as well: for example, people within air travel see the industry as highly operationally efficient and thus with relatively low ticket price offerings which seems generally unknown to the wider public, and people who are geographically or financially remote from air travel may not consider it as an option even if they move to a hub city or have access to more resources. Verge and Concept Fan helped to expand and direct future imaginings within these strict stated and tacit boundaries, especially through examining flows of change and through providing a framework to move past the logical but bad solutions through backtracking. It also allowed some pragmatic imagination, to explore what would be the wildest things that could happen under the imposed constraints. Discovering ways to incorporate the boundaries

within the creative imagination process instead of breaking them allows for new and creative ideas which also lead to much more practical and actionable ways forward.

Thirdly, the perspective of using social discourse to inform the directionality of air travel seems somewhat unique from what I could find, and especially at this unique time as the world recovers from COVID-19. In most cases, there is a tacit expectation that the system will inform the users' interaction with it and this means that most research that I have found has been done from the perspective of the system predicting user behaviour as normative under its rules. However there are many infrastructural systems that absolutely rely on peoples' collective initiative to survive, such as other transportation infrastructure or even digital communications infrastructure. Using this study and extrapolating for future shocks to air travel, or adjacent adaptations to other connective infrastructure, starts the conversation of looking at how people influence the system as well as vice-versa, and also how to generate effective change that also incorporates the interpersonal element for greater success.

6.3 AREAS OF FUTURE STUDY

This study was very high-level and so left many gaps! A further exploration of any or all of the topics discussed in the study would be a good complement. Here are some examples.

- A major gap could be filled by the aforementioned cultural analysis deep dive, as to how infrastructure becomes path-dependent such that it is difficult to imagine life by a different way.
- A complementary gap could be filled by doing an in-depth business case and strategic plan towards sustainability for an airline, or other strategic planning for companies in the air travel industry, to support them in genuinely prioritizing sustainability and adapting out of their paradoxes in time.
- Since it seems like this industry moves the fastest in following individual companies as opposed to top-down governance, doing a comparative case study of some of the more successful green airlines and some of the airlines which aren't green at all would be useful to understand plausible future directions.
- Discovering and testing the mechanics behind how to make people care about climate would be useful for another study set in a privileged and wealthy area like this one.

- Although climate activism is, and should be by many opinions, a responsibility for wealthy people and nations to take on, it still impacts the trajectory of the whole world - so a deep analysis of the viewpoints, actions, and contributions of less wealthy and privileged people to climate change and climate activism is sorely needed to inform international governance and other global initiatives.
- Uncovering and highlighting the perspectives of people and governments living in economically developing countries in relation to air travel, climate change, and international governance would be very useful going forward so as to gain a more global-majority view.
- If one wanted to do a systems thinking exploration of this infrastructural system, some major players are listed in Section 3.2.1, which might be a helpful first start.
- Building off of what I started in the second Concept Fan and examining how to get people to care more about climate change has practical implications for adapting air travel for sustainability, as well as other, non-air-travel-specific situations like climate negotiations – for example, intentionally including tangible decisions as part of the format might help the people negotiating feel like they have more control and thus might feel more confident.

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APPENDICES: VERGE & CONCEPT FANS

Following is three charts: the Verge wheel and both Concept Fans; in colour, and then repeated in greyscale.

APPENDIX A

VERGE WALKTHROUGH

In the centre of the wheel is: COVID-19 Lockdowns. Radiating outwards from it are six triangular categories of Define, Relate, Connect, Create, Consume, and Destroy. There are two types of boxes sorted within these categories: interpersonal, and systemic, and the farther away from the centre they are placed indicates both increased time and speculation from the COVID-19 Lockdown inflection point. Boxes within each of the six categories are also considered to be generally linked in value flow, progressing from the centre of the circle to the outside. However, since value progresses in a generally circular fashion around the categories, I'll describe the interlinking boxes across categories and then describe the radial flow outwards within each category after.

Starting in Define, the interpersonal box "People suddenly in their homes for months" leads to the Relate boxes "Figuring out new processes to do things without going outside" and "Childcare & teaching from parents at home", and the Connect boxes "Generally begrudging rise in digital work & play", and "Lots more info being shared". The Relate box "Childcare from parents" leads to the Destroy box of "Economic shock", which then leads around to the Relate box "People change how they do & feel friendship". The Connect box on "Lots more info being shared" leads to the Destroy box "Likeminded protests across the world against injustice by governments, race, and other power holders", and the Define box "Civil rights & ethical accountability on rise". Both of these boxes lead to the systemic Relate box of "Civil rights actions become international", and the 'Likeminded protests' box leads to the systemic Relate box of "Companies held accountable to their ecological / social frameworks".

The Relate box of "figuring out new processes to do things without going outside" leads to the Connect box of "Online exercise classes over Zoom", which then leads to the systemic Create box of "Startups facilitating essential activities online, for in-home participation".

Going outward within Define, the next box is the interpersonal "Activities are mostly digital or separated" as a result of the box of "People suddenly in their homes for months". This leads to the Relate box of "People change how they do & feel friendship" and the Connect box of "Lots more info

being shared” which leads to the previously described protests and holding companies accountable within Destroy and then Relate.

The next proximate box to the center is in Consume, which is the interpersonal “Sanitation measures important in deciding which in-person business to choose”. This links to the two systemic boxes in Destroy which are “Waste increases due to sanitation equipment”, and “Economic inequality heightened”, It also links to the interpersonal Relate box of “Mistrust or fear of public places and transportation”, which links to the Connect box of “Car & bike use rises since they’re extensions of one’s individual personal space”. This links to the Create box of “New ways of vacationing / staycationing”, and also to the Consume box of “Americans and Russians flout border & quarantine restrictions around the world to be tourists through border loopholes” which then leads to the Destroy box of “Local and international annoyance at people flouting quarantine restrictions for their own pleasure or because they are privileged enough to be able to do so”.

The aforementioned Create box of “new ways of vacationing” is precluded by the Connect box of “Staycations & local tourism on rise”, and then leads to the Consume box of “Parks and nature; exploring closer to home or within country”. Similar in trajectory is the systemic Connect box of “Films / videos / moving pictures” which leads to the interpersonal Create box of “TikTok dances, Vibe With Me’s” which leads to the Consume box of “Films / videos / moving pictures”. Also a bit broader in trajectory but along a similar line is the farther-out box within Connect of “Nostalgia”, which leads to the Consume box of “Americans & Russians flouting border & quarantine restrictions”. Also in Consume, the systemic box “Aviation fares rise to include sanitation measures” leads to the systemic Destroy box of “Air travel accessibility drops”.

Occasionally value goes backwards, especially after a wide-reaching shock like COVID-19, when everyone is trying to figure out how to react. Within this framework, this is shown through the more far-out interpersonal box within Define of “Confusion because of constant updates & directives on COVID-19”, which links backwards to the Destroy box of “Mistrust contributes to anti-maskers”. Another reverse value flow starts in the far-out systemic Define box of “Quarantine lifted much faster than border restrictions”, which leads to the interpersonal Destroy box of “Mild xenophobia” and also to the interpersonal Consume box of “Parks & nature”.

Here are the basic overlays of each category, radiating outwards. Because this framework mostly incorporates interpersonal things, I'll mention when a box is a systemic box but if not noted it should be assumed it's generated from the interpersonal information flow. In Define, the category starts out with "People in their homes", then "Activities are digital", then "Confusion because of constant updates", then the systemic "Quarantine lifted faster than border restrictions", then the "Civil rights accountability on rise".

In Relate, the category starts with "Figuring out new processes", then "Childcare", then "People change how they do & feel friendship", then "mistrust of public transportation", then three systemic boxes of "Airlines request government bailouts / financing to survive", "Civil rights actions become international" & "Companies held accountable", and finally the interpersonal box of "Change in nature of friendships".

In Connect, it starts with "Rise in digital work & play", then "Lots more info being shared", then "Commiseration", then "Car & bike use rises", then the systemic box of "Films / videos", then "Digital culture wars & platform allegiances", "Digital Etiquette", "Staycations on rise", "Online exercise classes over Zoom", and "If loved one is sick, people want to go to them, and resort to increasingly creative methods to connect". Finally, the last one is "Nostalgia".

In Create, it starts with the systemic box of "Video chat platforms & processes", then progresses on to "New ways of vacationing", "TikTok Dances", "Interactive videos", and the systemic "Startups facilitating essential activities online".

In Consume, it starts with "Sanitation measures important", then progresses to "Being stuck inside, many people start DIYing things", then "Parks & nature", then "Films / videos", then "Americans & Russians flout border & quarantine restrictions", and finally, the systemic box of "Aviation fares rise to include sanitation measures, insurance, debt recovery".

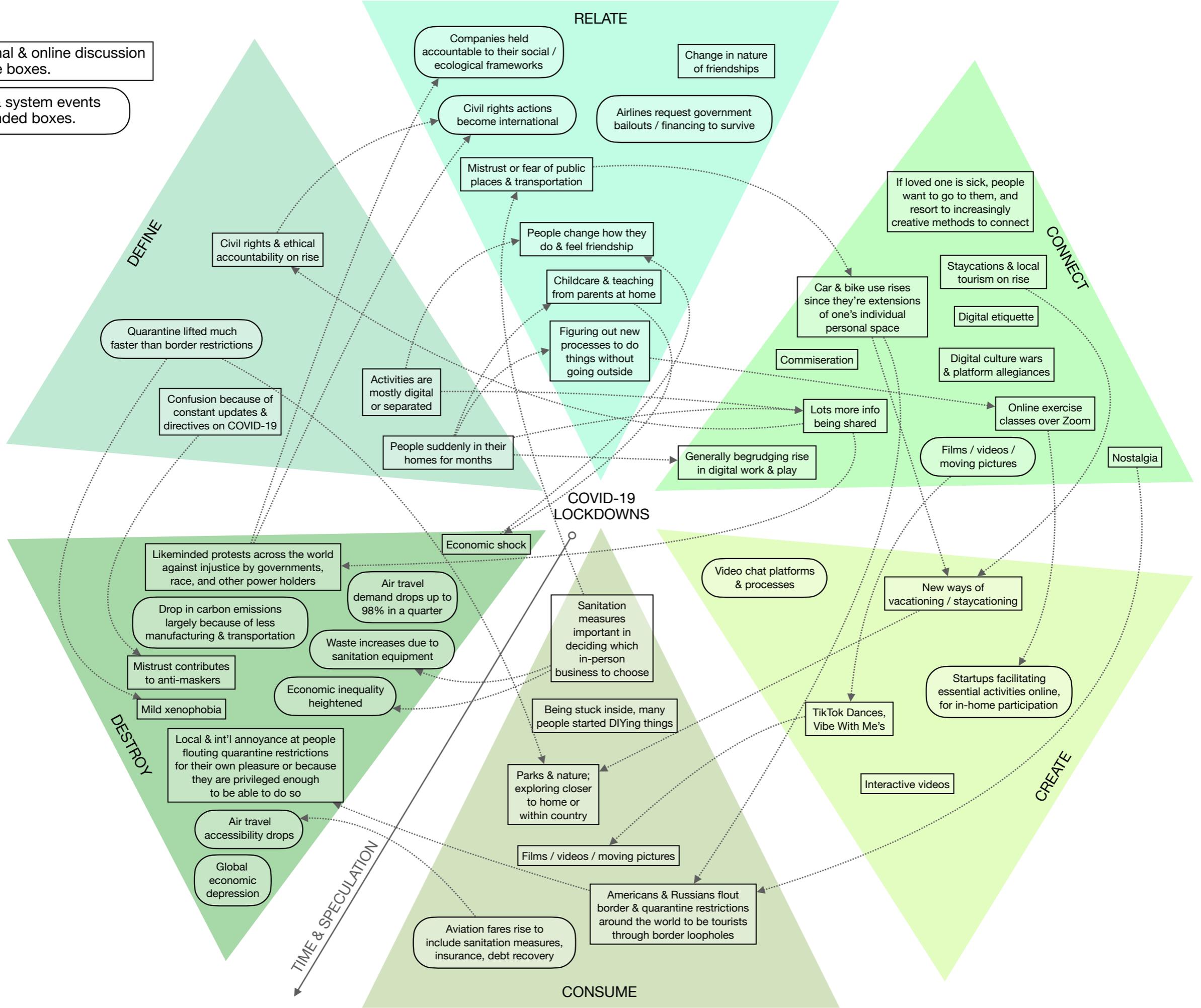
In Destroy, it starts with "Economic shock", followed by the systemic box of "Air travel demand drops up to 98% in a quarter", then the interpersonal "Likeminded protests across the world", and three systemic boxes of "Waste increases due to sanitation equipment", "Economic inequality heightened", and "Drop in carbon emissions largely because of less manufacturing and transportation". The outer edge is three interpersonal boxes of "Mistrust contributes to anti-maskers", "Mild xenophobia", and

“Annoyance at people flouting quarantine restrictions”, as well as two systemic boxes of “Air travel accessibility drops” and “Global economic depression”.

VERGE

Interpersonal & online discussion is in square boxes.

Industry & system events are in rounded boxes.



APPENDIX B

CONCEPT FAN #1 – REIMAGINING AIR TRAVEL FOR SUSTAINABILITY.

The six Verge categories of Define, Relate, Connect, Create, Consume, and Destroy are stacked in horizontal rows so that concept fan ideas can be categorized as to what kind of value they would generate. First, the Research question (in Define) starts the concept fan off by asking “How might we reimagine air travel for ecological sustainability?”. From here, three solution categories flow into Relate and they are “Politically”, “Socially” and “Financially”, while two others flow into Create which are “Logistically” and “Technologically”. The final solution category is in Destroy and it is “Via post-COVID attrition”.

Moving from the top down, the two flows from “Politically” are both in Define, which are “Via governments regulating” and “Via ICAO”. The Government box flows into “ESG Metrics” in Relate, “Green certification” in Create, and “Carbon taxes” and “Offset everything!” in Consume. The “Via ICAO” box leads to “Hybrid electric [motors]” in Connect, and “Offset everything!” in Consume as well.

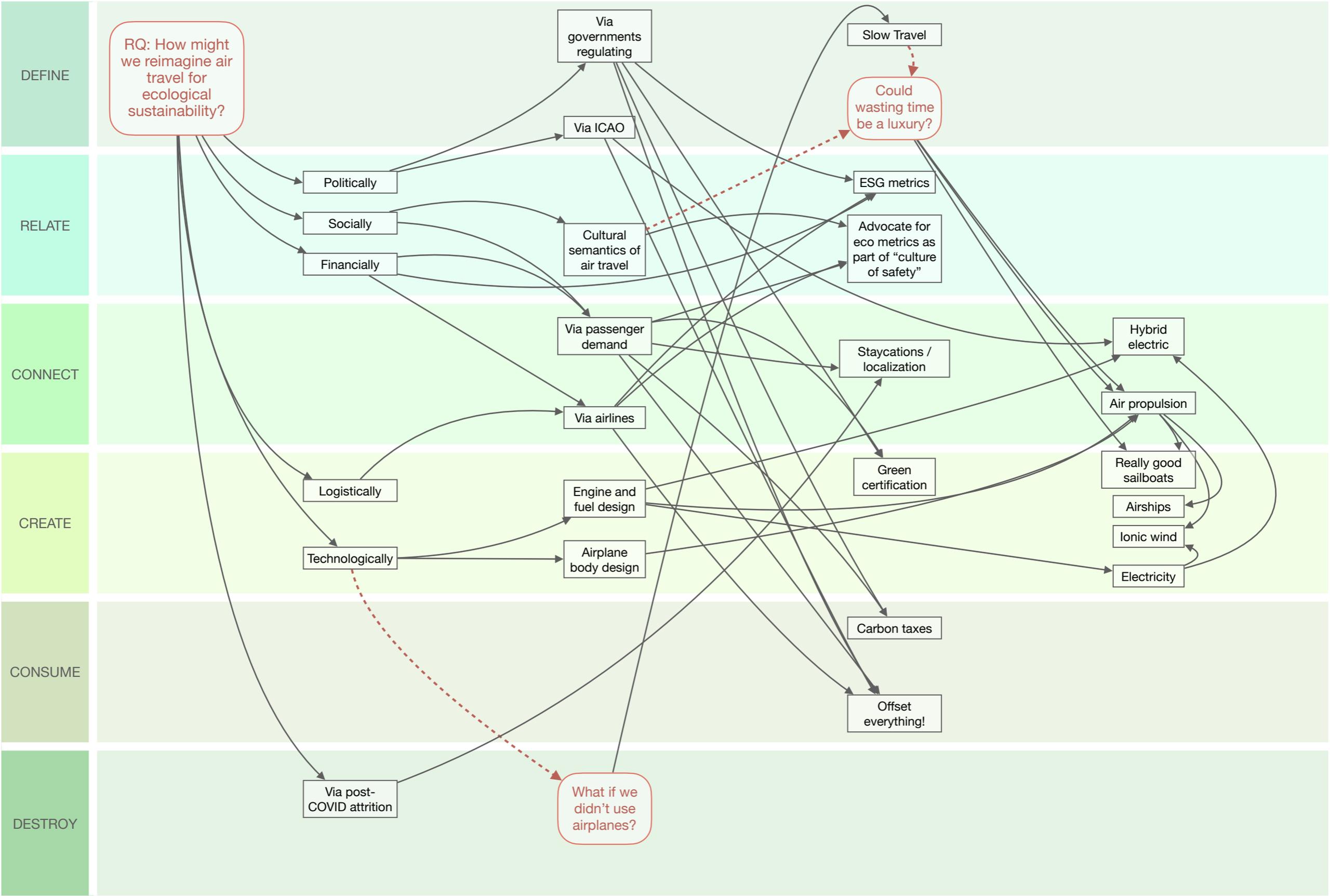
Moving back a flow, the “Socially” box flows into “Cultural semantics of air travel” in Relate, and “Via passenger demand” in Connect. From Cultural semantics flows a question in Define, which is “Could wasting time be a luxury?” If the answer to this question is yes, two potential options exist which are “Air propulsion” in Connect and “Really good sailboats” in Create. Air propulsion also leads to really good sailboats as well. One last flow from the Cultural Semantics box is to an idea in Relate called “Advocate for eco metrics as part of [aviation’s] culture of safety”. Moving down to “via passenger demand”, it flows into the “Advocate for eco metrics” box as well as to “green certification” in Create, and “carbon taxes” and “offsets” in Consume.

The Financial flow leads to “via passenger demand” outlined above”, as well as to “ESG metrics” and to “via airlines” in Connect. The Airlines box flows to ESG Metrics, Advocating for eco metrics, and Offsetting everything. The Logistical flow also leads to “via airlines” and the rest of the flow outlined here.

The Technological flow leads to two different areas in Create, which are “engine and fuel design” and “airplane body design”. Engine and fuel design leads to the aforementioned Hybrid electric and Air propulsion in Connect, as well as to “Electricity” in Create. Electricity leads to Hybrid electric as well as “Ionic Wind” in Create. The aforementioned Air Propulsion box leads to three ideas in the Create section which are “really good sailboats”, “airships”, and “ionic wind”. “Airplane body design also leads to Air propulsion as well. However the technological stream also generates a question, in Destroy, which is “What if we didn’t use airplanes?” This question leads to an idea in Define called “Slow Travel”, which also leads to the question of “Could wasting time be a luxury?” and from thence the pathways flow as mentioned above.

CONCEPT FAN

Questions are in rounded coral boxes with dashed arrows.



APPENDIX C

CONCEPT FAN #2 – FOR FINDING SOLUTIONS TO CLIMATE APATHY POST-COVID.

This fan has the same structure as the previous one. Starting off in Define with the question of how to encourage people care about sustainability, two ideas are spawned in Relate, which are: “Guilt-trip them” and “Make it fun”. Three questions are spawned in Connect, which are: “Is it a question of understanding?”, “Of empathy towards the planet?”, and “Of intangibility?”. And one idea in Consume which is “Bribe them”.

In the third stack of concepts, Bribe them leads to questions (still within Consume) of “With what?” and “How do we make the bribe sustainable or ongoing?” Both of these questions progress to an idea in Create which is “Money – A national climate lottery wherein to enter you need to prove low emissions, funded through offset programs”. This leads to a question in Destroy about “Doesn’t this encourage caring more about money and clout anyway?” which leads to an idea in Consume called “Pro sports teams’ or leagues’ sponsorship or genuine cause alignment” and another idea in Connect called “National or university challenge (with awards)”. This last idea leads to the Research Question in Relate and the start of a new concept fan.

Going back to the top, “Guilt-trip them” leads to a question in Destroy which is “Has this even been working?” which ends this thread. Moving down to the three questions in Connect: the “question of understanding” leads to another question in Destroy which is “Or denial / willful ignorance?” which then leads to the “Bribe them” thread. All three original questions in Connect lead to an idea in Create which is “Climate field trips for adults / as corporate retreats”. The last question of “intangibility?” leads to another idea, also in Create, which is “Location-specific tracking of observable climate change metrics” which leads to an idea in Consume called “Like a monthly weather report except for sea level rise or carbon % in atmosphere”. This leads to a question in Relate called “Do airplanes have to go collect that data?” and this ends this thread.

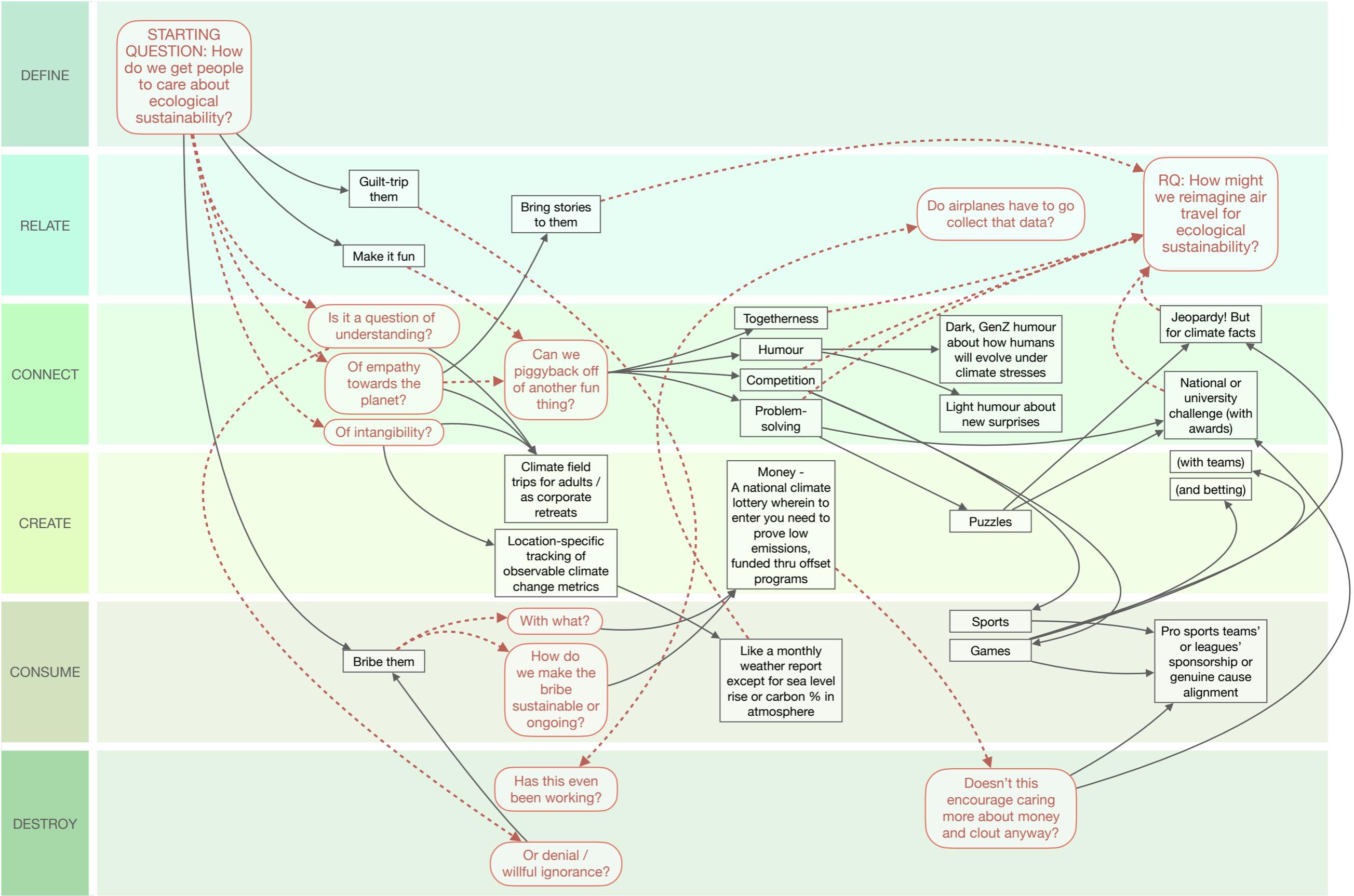
The second question of “Empathy” leads to an idea in Relate called “Bring stories to them”, which leads to the research question (also in Relate) and the start of a new concept fan. The original

first concept of “Make it fun” and the second question of “Empathy towards the planet” both lead to a question in Connect called “Can we piggyback off of another fun thing?”. This leads to four ideas in Connect called “Togetherness”, “Humour”, “Competition”, and “Problem-solving”. The first three lead to the research question. “Humour” also leads to two ideas, both also in Connect, that are about framing humour and they are “Dark, GenZ humour about how humans will evolve under climate stresses” and “Light humour about new surprises”. Going back an order of magnitude, the “Problem-solving” idea in Connect leads to the idea of “Puzzles” in Create, which then leads to two new ideas in Connect called “National or university challenge” and also “Jeopardy! But for climate facts” referring to a tv game show format. Both of these lead to the research question.

“Competition” leads to two ideas in Consume called “Sports” and “Games”, both of which lead to another Consume idea called “Pro sports leagues’ cause alignment”. “Games” also leads to sub-ideas of the Connect idea of a “National or university challenge (with awards)”, and these sub ideas are located in Create and are “(with teams)” and “(and betting)”. “Games” also leads to the “Jeopardy!” idea in Connect, which then leads back to the research question and a better start for a new concept fan.

CONCEPT FAN #2

Questions are in rounded coral boxes with dashed arrows.



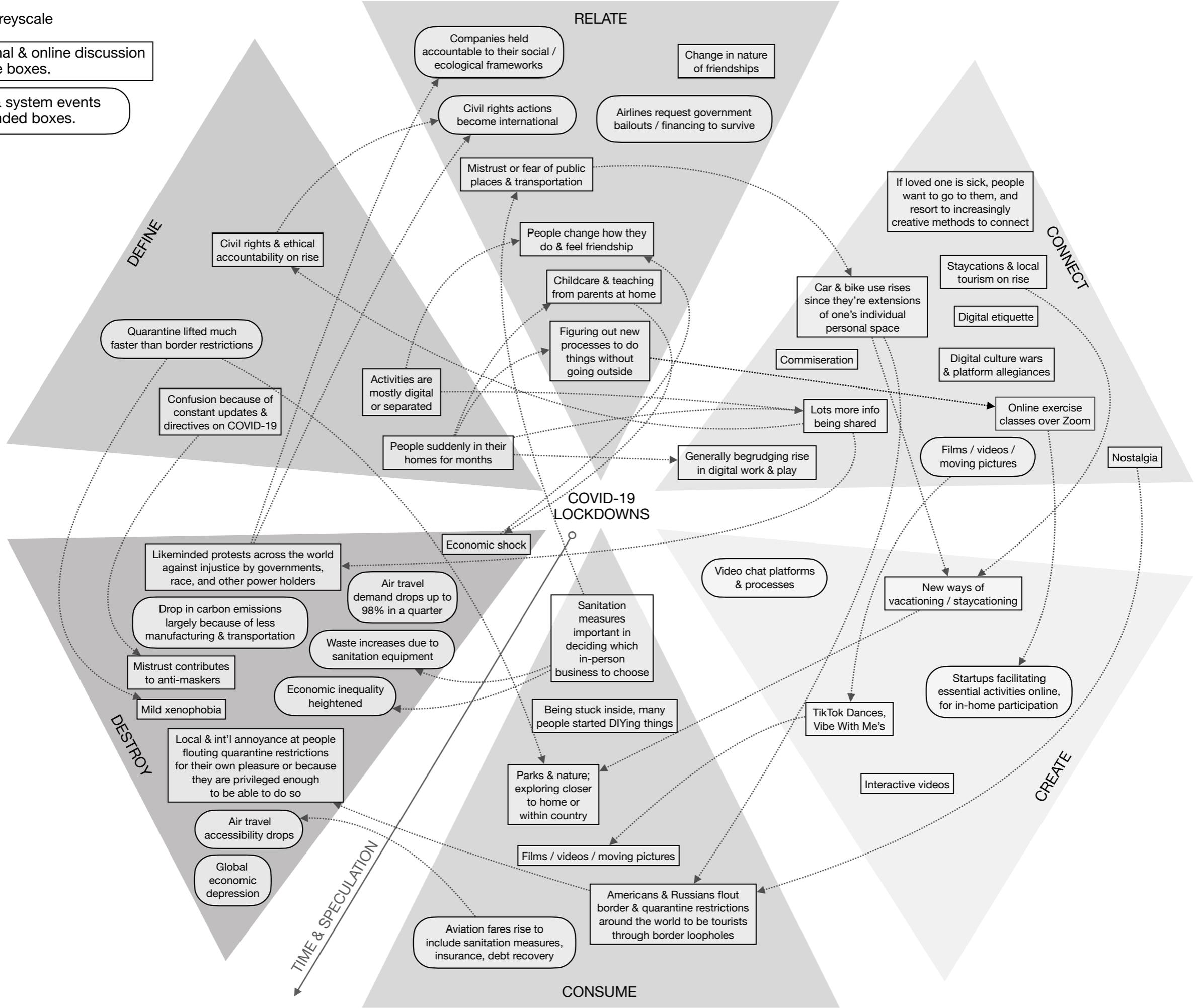
APPENDIX D

GREYSCALE FRAMEWORKS

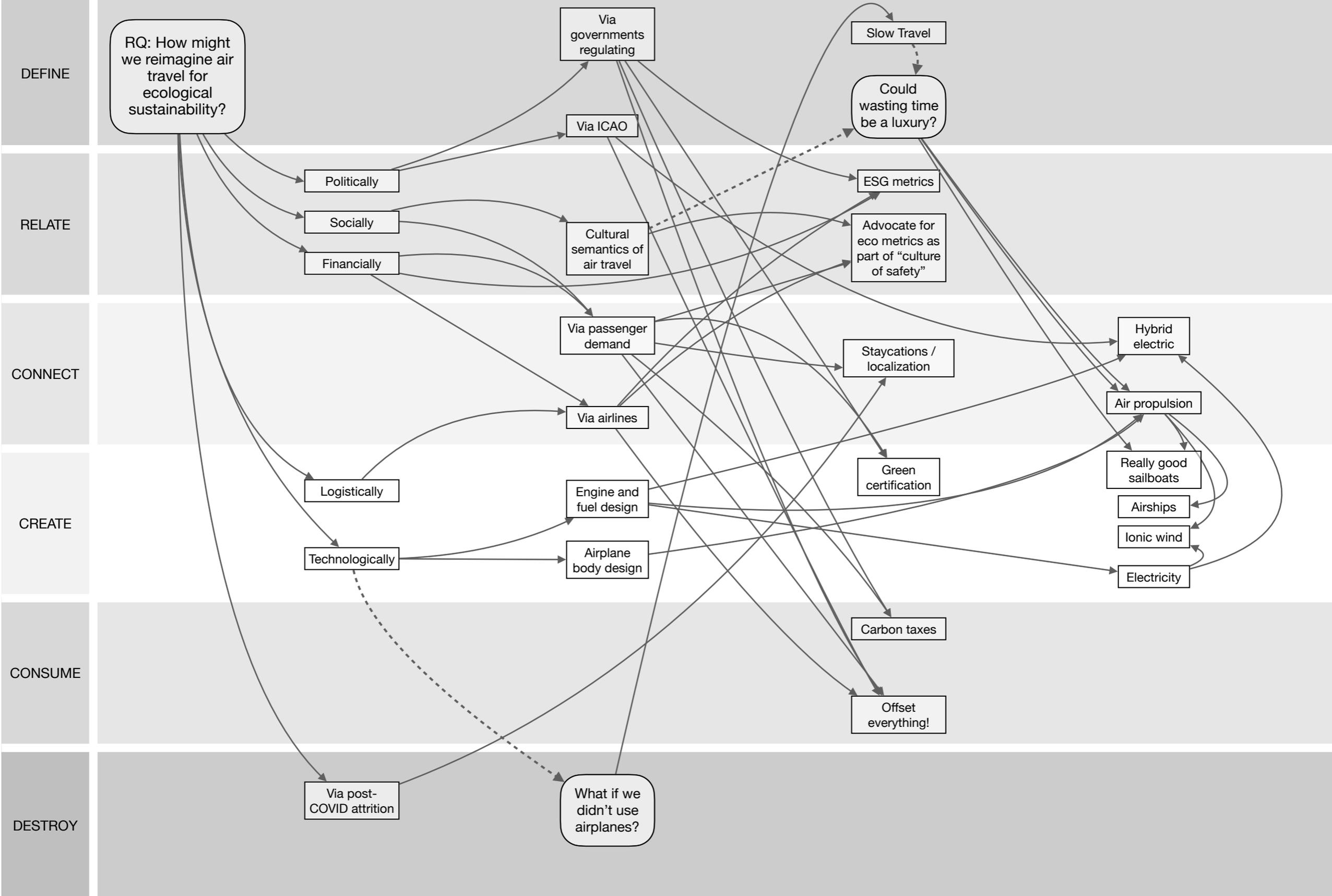
Following are the three large frameworks in greyscale.

Interpersonal & online discussion is in square boxes.

Industry & system events are in rounded boxes.



Questions are in rounded boxes with dashed arrows.



CONCEPT FAN #2- Greyscale

Questions are in rounded boxes with dashed arrows.

