AIR TRAVEL AND CLIMATE – A GUIDE FOR TEACHERS

Background information and exercises

INTRODUCTION

This learning material discusses air travel from the perspective of climate change. It is intended specifically for the use of teachers in upper secondary schools and grades 8 and 9 of basic education as well as for everyone interested in this theme.

The learning material focuses on air travel particularly from the perspective of its climate impacts. Air travel has numerous other impacts on the environment, however, including land use for airports, noise impacts and other emissions besides carbon dioxide. While the material does not discuss these impacts, they may come up or be brought up in discussions. The learning material focuses primarily on leisure travel by air.

Other impacts of leisure travel, including land use changes and destruction of natural environments associated with the construction of accommodation and other services, species and habitats becoming endangered, lowering of groundwater levels or local degradation of water quality, are excluded from this material but may come up or be brought up when completing the exercises. The impacts of climate change are also affecting the tourism industry in many ways. More frequent extreme weather events, such as heat waves, forest fires, drought, floods, storms or reduced snow cover, can affect the destinations and peak season of travel. The impact of climate change on the tourism industry is not discussed in this material, but it may also come up or be brought up in discussions.

This material is intended as a stimulus for considering the extent to which air travel of the current type can be adapted to planetary boundaries and the principle of sustainable wellbeing. It is also an invitation to create a more climate-resilient travel culture and to rethink travel. Welcome!

Objectives

- Raising awareness of the climate impacts of air travel, their distribution in the world, and the possibilities to reduce the climate impacts of flying at different levels.

- Sparking discussion on the climate impacts of air travel in a constructive and inquisitive spirit.

- Awakening people to reflect on the social and cultural significance of air travel at the level of their reference group and larger society.

- Coming up with ideas of what travel could be like in a world where consumption is kept within climate-sustainable limits.

Acknowledgements

SISÄLLYS

1. CLIMATE IMPACTS OF AIR TRAVEL AND THEIR DISTRIBUTION ON THE GLOBE

This section discusses the following topics:

- How does air traffic affect climate change?
- How has the volume of air travel developed?
- How are emissions from air travel distributed?
- Emissions from air travel and carbon budget for the 1.5-degree target

Flying generates a small share of global greenhouse gas emissions

While air traffic accounts for approx. 2.5% of the global carbon dioxide emissions, aircraft also contribute to climate change in other ways: the nitrogen oxide and fine particulate matter emissions and water vapour produced by them in the upper atmosphere warm the climate. Taking these effects into account, air traffic accounts for approximately 3.5% of global warming.[1]

The global volume of air travel has increased rapidly, and this growth has accelerated in the 21st century. (Figure 1) Factors driving this increase have included low-cost flying and an increase in the average standard of living. It is partly explained by internationalisation in many sectors and the resulting increase in mobility.[2] As the COVID-19 pandemic broke out in 2020, there was a sudden drop in the volume of air traffic as severe restrictions were imposed on travel. However, the number of flights started to increase as soon as 2021. In 2022, the passenger numbers were only about one fifth lower than before the pandemic.[3] It has been estimated that the demand for air traffic will continue to increase at an annual rate of approx. 4% over the next twenty years.[4] (Figure 1)

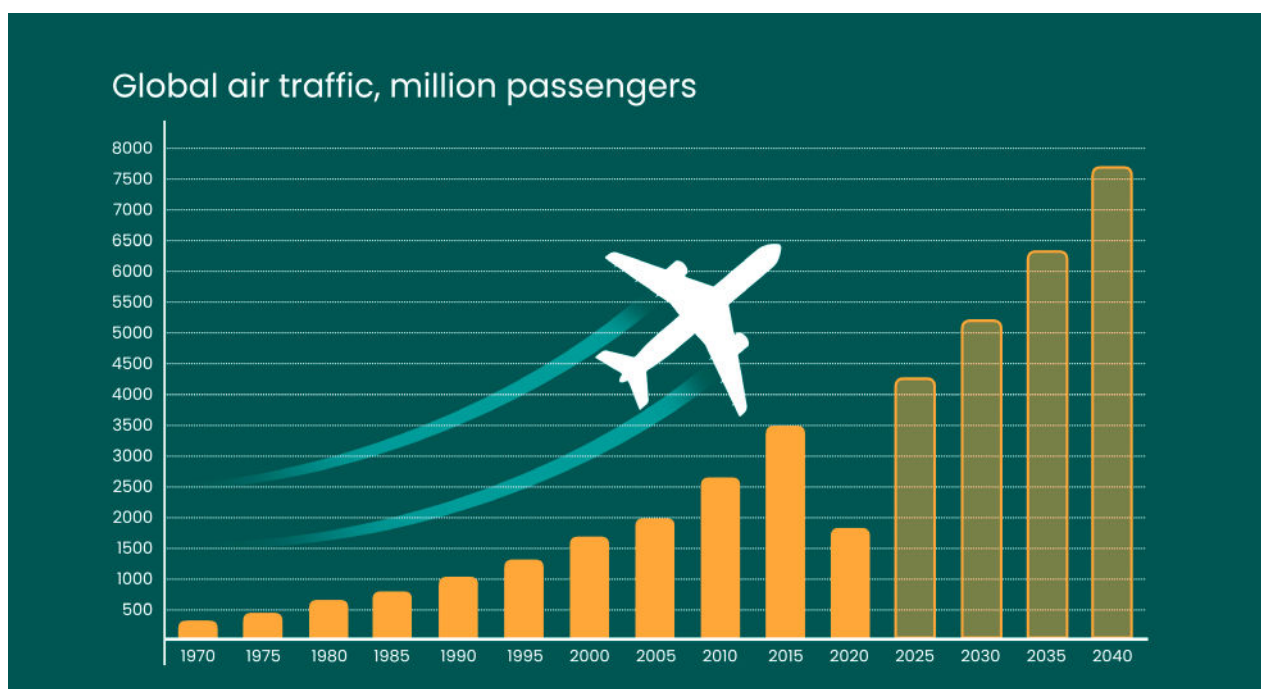## The emissions from air travel are produced by a small share of the

Figure 1. Development of passenger flights in 1970–2020 and predicted increase until 2040.[4, 5]

Figure 2. It has been estimated that 1% of the world's population produces one half of the air travel emissions. Approx. 80% of the world's population have never taken a flight.

world's people

Air travel is an example of an activity that is distributed very unevenly among the global population. According to estimates, around 80% of the world's population have never taken a flight. The 1% of people who fly the most generate about one half of all aviation emissions (Figure 2). Every year, only a very small proportion of people fly abroad: in 2018, for example, an estimated 2% to 4% of the world's population took an international flight.[6]

Air travel increases the individual's carbon footprint

The Paris Climate Agreement signed in 2015 aims to stop global warming at 1.5 degrees above pre-industrial levels. Only a limited amount of carbon can be released into the atmosphere to prevent the climate from heating up by more than the 1.5 degrees set as the target. This means that humankind has a limited carbon budget at its disposal. If the remaining carbon budget is divided equally among all people in the world, an estimate of the individual carbon footprint consistent with the 1.5 degree target is obtained. This carbon footprint should be gradually reduced as 2050 draws closer. An individual's carbon footprint consists of the emissions generated when the products and services they consume are produced. For example, emissions are generated from housing, mobility and food as well as various goods and services. When calculating the carbon footprint, the emissions over the entire lifecycle of a product or service are factored in.[7] The carbon footprint is

Fact box

What does a tonne of carbon dioxide equivalent mean?

The carbon footprint is often expressed in tonnes of carbon dioxide equivalent (CO_2-eq. or CO_2 equivalent), even though in everyday language, we usually talk about tonnes of carbon dioxide or carbon tonnes. A tonne of carbon dioxide equivalent is a unit obtained by comparing the climate impacts of all greenhouse gases to those of carbon dioxide. For example methane, which is produced

in agriculture and landfills among other sectors, is a much more potent greenhouse gas than carbon dioxide. Consequently, one tonne of carbon dioxide equivalent corresponds to one tonne of carbon dioxide in terms of its climate impact.

2021
Average carbon footprint per person globally
4.7 t CO$_2$-eq.

Long-haul return flight (Helsinki-Bangkok) up to 4 t CO$_2$-eq.

2030
Carbon footprint in line with 1.5-degree target/person
2.5 t CO$_2$-eq.

Return flight within Europe (Tallinn-Paris) up to 0.8 t CO$_2$-eq.

2050
Carbon footprint in line with 1.5-degree target/person
0.7 t CO$_2$-eq.
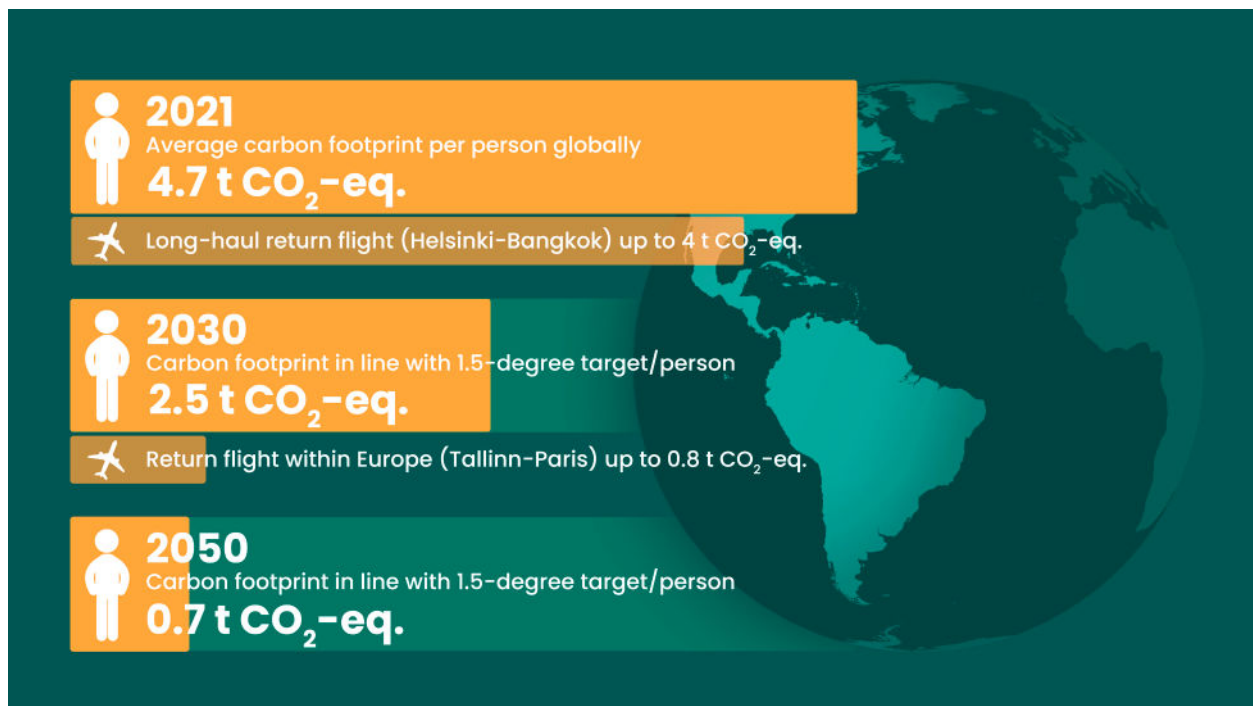
Figure 3. The average carbon footprint of a person in 2021 and the carbon footprint for 2040 and 2050 in line with the 1.5-degree target. The climate impact of one long-haul return flight and one return flight within Europe in proportion to the carbon footprint. [7, 8]

strongly linked to prosperity. This is also reflected in emissions from travel, and especially from air travel. The wealthier the population, the higher the average number of flights they take.[6]

While air travel accounts for a small share of the global greenhouse gas emissions, flying has a major impact on the individual's carbon footprint. It has been estimated that to reach the 1.5-degree target, the average carbon footprint of an inhabitant of this planet should drop from the current approx. 4.7 tonnes of carbon dioxide equivalent (CO$_2$-eq.) to approximately 2.5 tonnes of CO$_2$-eq. by 2030, and to 0.7 tonnes of CO$_2$-eq. by 2050.[7] The climate impact of a single intercontinental flight can correspond to several tonnes of carbon dioxide and that of a flight within Europe to almost one tonne. This calculation includes the full climate impact of flying, not only the carbon dioxide emissions.[8] (Figure 3)

Passenger transport and leisure travel are the main source of air travel emissions

The majority of global aviation emissions are generated in commercial passenger transport. Changes in passenger transport will consequently have the greatest impact on future trends in these emissions, although air freight, military aviation and private flights are also important (Figure 4).

When we look at all international travel in 2019, aviation accounted for more than one half of the trips (59%). More than one half of the trips abroad (55%) were taken to have a holiday. Meeting friends and relatives or reasons related to health or religion accounted for 28% of all trips abroad, whereas business travel accounted for 11%.[9] Compared to 2000, the shares of holiday travel and foreign travel by air have increased by several percentage points: in 2000, holiday travel accounted for 50% of international travel, while air travel accounted for 46%.[9]

Aviation emissions by type of traffic

- ■ Commercial passenger transport
- ■ Commercial freight transport
- ■ Military aviation
- ■ Private aviation

71%
17%
8%
4%
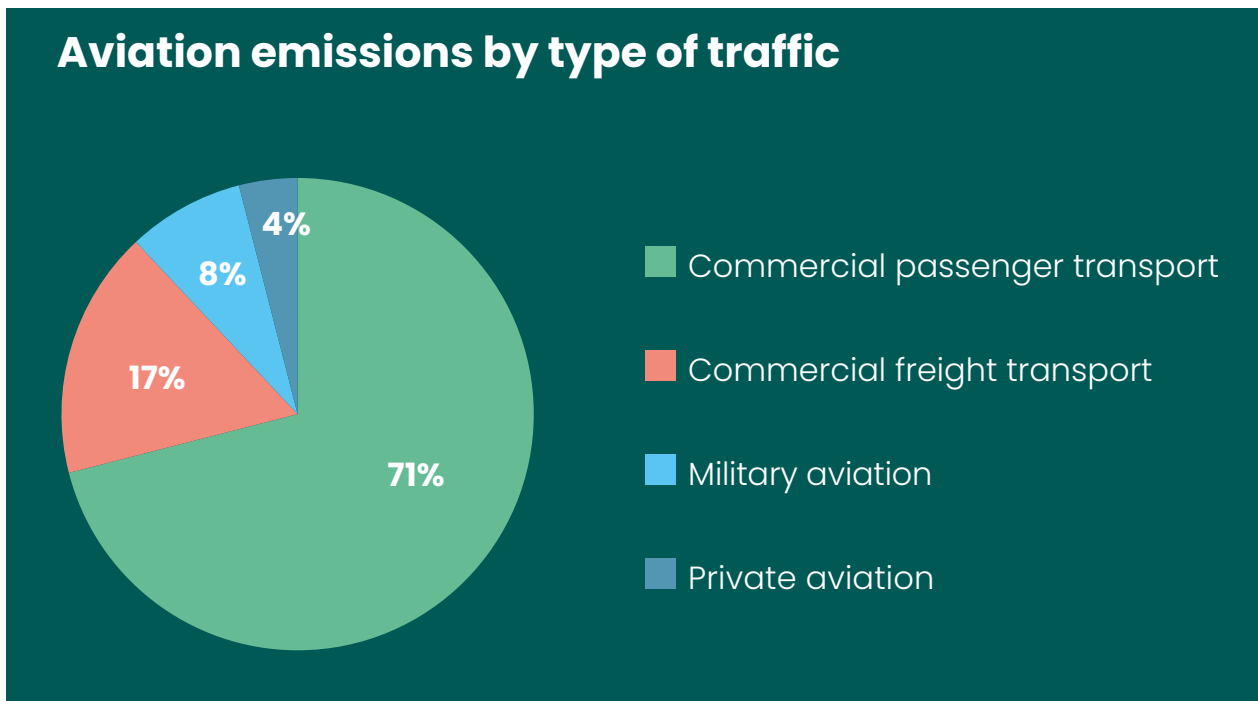
Figure 4. Global aviation emissions by type of traffic. [6]

Exercises

To do the exercises, you need to print out Figures 1 to 4, or you can display them on a computer screen, mobile device or similar.

- Select a figure and discuss it with your pair or in a small group.

- What do you think the key content of the figure is?

- Does it contain something that is new or surprising to you?

- Describe the contents of the figure to another pair or group who have not seen it.

- Does the figure raise additional questions? What else would you like to know about the climate impacts of air travel? Find answers to any additional questions together.

- Find out what the inhabitant's average carbon footprint is in a few different countries. What causes the differences in the carbon footprint size?

2. CULTURAL AND SOCIAL MEANINGS OF AIR TRAVEL

The objective of this section is to discuss air travel and the role it plays in our culture. What types of cultural and social meanings are associated with air travel, and how have they changed or are currently changing?

Air travel – from luxury to normal part of life for a small share of people

Awareness of the climate impacts of flying has increased significantly in recent years. However, environmental awareness and environmentally-friendly values do not automatically lead to changes in an individual's actions. In the case of air travel, this inconsistency between values and actions is particularly obvious.[10]

Most people support climate change mitigation in principle. While many are attempting to reduce the environmental impact of their consumption, this does not always apply to travel. In fact, travel is easier to overlook than other areas of life in terms of living by your environmental values. As the reasons for this have been suggested the idea that when travelling, you are also 'taking a holiday' from the principles that otherwise guide your everyday life, and on holidays, personal values are generally followed less strictly than in everyday life.[12] In addition, part of the world's population takes air travel for granted and it has become a perceived right for them, something that is hard to give up.[13,14] Relatively cheap flights have made it possible for an increasing share of prosperous people on the globe to travel to places that may not be accessible by other means of transport, at least not as quickly and easily.

Travel is often associated with positive images

Travel and air travel are often thought of in terms of freedom. The freedom of air travel is relative, however, and only applies to the few people who can afford the time and money to travel. For financial reasons, air travel is not possible for everyone even in the wealthy Western countries. There also are major inequalities between citizens of different countries regarding the number of countries to which they may travel without a visa.

Meanings of a high social status, success and networking are often associated with frequent trips abroad, and mobility is glorified in many ways. People see travel destinations as a kind of trophies that they compare with their reference group members[15,16], whereas staying put can sometimes be seen in a negative light as 'stagnation'.[16]

Such people as celebrities and social media influencers play an important role in shaping social norms. They have more influence than so-called ordinary people on the type of consumption and lifestyles that are considered desirable and acceptable. Consequently, public figures can also reinforce or challenge existing norms associated with travel and going on holidays. Artists, athletes or other celebrities who have stopped flying for climate reasons can inspire others with their example. Examples can help us question air travel as a norm for people with a particular social status.[17]

A change in the air? Awareness of the climate impacts of air travel has increased

Some indications of a change have been seen in recent years. Air passengers are increasingly worried about the climate impacts of flying, and a small proportion of people have announced that they have reduced or stopped flying for climate reasons. [18]

The climate strike initiated by the Swedish climate activist Greta Thunberg in 2018, which thousands of schoolchildren joined, gave the impetus for the Fridays for Future movement. This movement increasingly started discussions in conventional and social media about the significance of the individual's personal carbon footprint and the moral responsibility of persons generating high volumes of emissions for climate change mitigation. Flying was increasingly discussed from the perspective of climate justice and the distribution of emissions. Around the same time, the term 'flight shame' was introduced in Sweden, from where it spread to other parts of the world.[18] Flight shame has been defined as an individual's feelings of shame and guilt over the climate impacts of flying. [19,17] People have started talking about the legitimacy, necessity and desirability of flying from the climate perspective.[18] Despite this, apart from the temporary drop in aviation emissions caused by the COVID-19 pandemic, there are no signs of a more permanent curbing of the growing trend, and the growth is expected to continue instead.[4]

Obstacles to flying less

Several reasons have been found for the fact that some people regard reducing or stopping air travel as unnecessary or experience it as difficult, despite increasing climate awareness. The social norms around us have an impact on the need to travel experienced by people and the perceived legitimacy of travel. It has been found that foreign travel can be an important part of a person's lifestyle and identity.[20] Perceived obstacles to reducing or stopping air travel include the following[11, 28] :

- One's circle of friends or social reference group fly more often, which makes the number of flights one takes seem reasonable.

- When accustomed to travelling by air, avoiding it seems like an unreasonable sacrifice if others around continue to fly.

- Feeling of powerlessness: the idea that one's choices make no difference to climate change as it is a problem on such an enormous scale.

- Feeling that the responsibility for reducing the climate impacts of flying rests with companies and states rather than individuals.

- Being convinced that technological advancement will lead to low-emission air travel, which is why reducing it is unnecessary.

- Believing that one has a low-emission lifestyle in other respects (such as being a vegan, not owning a car, minimising consumption), and thinking this compensates for the emissions from air travel.

- Insufficient knowledge of the climate impacts of air travel and a difficulty of putting them into proportion with the climate impacts of other consumption.

- The alternatives to air travel are expensive and time-consuming and require much more effort.

- Air travel is unavoidable to meet relatives and friends.

- Finding that travel increases one's happiness and supports the wellbeing and considering it justified regardless of its climate impacts.

- Believing that paying for voluntary emission offset services cancels out the emissions from air travel.

Sometimes awareness raising leads to flying less

A small proportion of people have stopped flying completely or reduced the number of flights they take significantly for climate reasons. Studies have found that these people experience a personal and moral obligation to take action to mitigate climate change and have distanced themselves from social norms that closely associate air travel with holidays and social status. However, awareness of the climate impacts of flying alone is usually not sufficient motivation to stop flying, and other factors are also involved.[20,14] Factors observed in studies of people who have stopped or significantly reduced flying for climate reasons in Finland and Sweden include[19,21]:

- Awareness of the seriousness of the climate crisis as well as values and emotions are key motives for those who have given up flying.

- Discussions on the climate impacts of flying with family or friends or the example set by those who have stopped flying in a person's immediate circle or in the public sphere have sometimes contributed to the decision.

- Personal experiences of extreme weather events or turning points in life, such as the birth of a child or grandchild, have influenced some people's decisions to stop flying.

- Giving up flying can evoke many kinds of emotions, such as regret over things you have not done, or guilt for the trips you have taken.

- Those who have given up flying mostly experience slower forms of travel as enjoyable, and meaningful.

People assess the importance of and necessity for various trips in different ways. Trips related to meeting friends and relatives are regarded as particularly valuable, and giving them up is often seen as more difficult than giving holiday trips or business travel a miss.[22,23,24]

Exercises

Go through the reasons revealed by studies presented in this section for why avoiding air travel is difficult for the individual, or not considered meaningful.

- What do you think about these arguments for flying? Do you find some of them better than others?
- Have you seen these arguments being used in different contexts, or do some of them apply to you?
- Have you encountered social conflicts associated with travel and flying in your life?
  - Describe this situation.
  - Were the conflicts resolved or not?
    - How was the solution reached/why was the solution not successful?
- What emotions does air travel (your own or others) evoke in you?
- Do you find that air travel and tourism in general as well as the social norms associated with them have changed during your life?
  - If yes, what kind of changes have you noticed?
- Have you come across the term flight shame?
  - If yes, in which contexts?
  - Do you recognise this phenomenon in your immediate circle or in broader society?
  - How do feel about this term and its use? What kind of effect do you think using it has?
- Are you following social media influencers who deal with travel?
  - If you do, please share some examples and experiences. Is the climate perspective discussed in social media in the context of travel?
- Interview a representative of another generation, such as your parents or grandparents:
  - What was travel like in their childhood/youth?
  - Have they travelled by air? If yes, when did they do it for the first time? What kind of experiences do they have of their own or other people's air travel?
  - Do they find that travel and air travel have changed? If yes, how?

Air travel in advertising

For this exercise, you will need travel advertisements. You can collect ads (newspaper clippings or web addresses/screenshots) in advance or assign this task to participants. Advertisements can be sought in such sources as newspapers, tourism magazines, travel agencies' and tour operators' websites, and airline websites.

- Select one ad and introduce it to your pair/group. You can answer some of the following questions:
  - What kinds of emotions and images do you think the ad aims to evoke?
  - What kind of emotions and images does the ad evoke in you?

- If you think that the ad is inconsistent with climate change mitigation, you can design a counter-advertisement for it. (A counter-advertisement is a form of visual culture expression that creates a parody of an ad, makes a joke about it and criticises it, commenting on the problems of the consumer society by using advertising language.) You can find examples of counter-advertisements here (in Finnish): https://toivoajatoimintaa.fi/oppilasohje-nain-teet-vastamainoksia-itsenaisesti/

- Design an ad for a real or imaginary climate-resilient trip, such as a train journey or cycling trip. When putting the ad together, you can try and draw on information about the low climate impacts of train journeys or cycling trips, or do it without referring to climate issues at all.

Air travel in the media:

For this exercise, you will need news items and other articles discussing air travel. You can find them in newspapers and magazines and on media websites, or assign this task to participants.

- Answer the questions based on a specific news story or other newspaper article:

  - Does it draw attention to the climate impacts of flying? If yes, from what perspective? (states, companies, citizens... global or national perspective?)

  - Does it discuss the possibility of reducing the climate impact of flying?

    - Which means does it discuss?

    - Who is expected to take action to reduce emissions from air travel? (such as states, companies, citizens...)

  - Can you think of any perspectives which are not discussed in the article but which you think would be important?

3. PEOPLE ABOUT TO TAKE OFF

All trips are linked to the social, physical, economic, and cultural environment of the traveller in many ways. This section discusses and examines the challenges that an individual can face regarding low-carbon travel in different life situations.

What are the different ways in which flying can be part of people's lives, and what kinds of changes does reducing flying require at the level of society and the individual? The situations of the persons described below highlight different aspects of air travel in today's society.

Jaakko a father of primary school age children living in Helsinki, is increasingly aware of the climate impacts of flying. The family has been in the habit of flying to destinations within or outside Europe for a holiday once or twice a year, often with another family they are friendly with. Now their friends are proposing an autumn holiday on the Canary Islands. The children are excited about the proposal and already planning everything they want to see and do on their trip. Jaakko has become anxious about the idea, but his spouse feels they have the right to enjoy the trip, as the year has been difficult and she is the informal carer of her mother, who has a memory disorder.

Aradhya moved to Northern Italy to study two years ago and has not seen her family in India since, except on video calls. She is planning to fly to India for two weeks during her Christmas holidays. Aradhya has a brother and a good friend who live in London. Aradhya has visited them three times, travelling by air because it is faster and cheaper than a train when you buy the tickets on time.
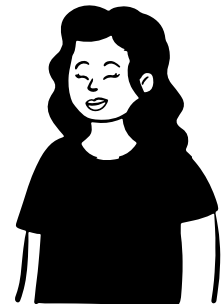
Karin has recently become a grandmother. Her new-born grandchild lives in the United States, while she lives in Sweden. Karin, who has a well-paid job, is retiring in a year's time. She wants to see her grandchild immediately and has bought flights to visit his son in California for a long weekend, as she can only take two days off work right now. After retiring, Karin is thinking of living in California six months a year to help care for her grandchild.

Anton is a first-year student in Tallinn and has recently joined student union activities. His student friends have noticed an offer for cheap flights to Berlin for a long weekend and ask Anton to join them. Anton is aware of the climate impacts of flying, and discussions with his climate activist friend have recently led him to feel more responsible for his choices. On the other hand, Anton would not like to be excluded from the group, and the trip would no doubt be fun. He is particularly interested in one of the friends who will go on the trip, and the interest seems to be mutual. Anton would like to propose a low-carbon alternative for the trip, but he wonders if he could be brave enough to bring up the matter in a group that he does not yet know well.

Sandra and Sasha have spent their holidays in the UK, their home country, for two years due to the pandemic and got to know many new places. They now feel that domestic tourism is no longer enough, and they want to escape the darkness of winter and travel to Thailand for two weeks, which they have visited many times over the years. As they purchased their flights, they paid a voluntary emission offset charge to finance afforestation projects in developing countries. Sandra and Sasha think of Thai tourism entrepreneurs whom they know and who have suffered financially from the pandemic. Both find the recovery of tourism important because Thailand and many other countries depend on the tourism income for their economy and people's wellbeing.

Felipe is aged 35 and lives in Barcelona. His hobby is climbing, and he is in the habit or working a lot and living on as small a budget as possible to afford a trip of a few weeks to the Andes or Himalayas once a year to climb with other enthusiasts from different countries. The climbing community is important to Felipe, and many of them have become his close friends. Felipe is aware of the climate impacts of air travel and sometimes feels bad about flying, but the idea of giving up the trips seems impossible.

Exercises

- Choose one of the people described above and immerse yourself in their situation (alone, in pairs or in a small group).
  - What could the person do in their current situation to reduce the climate emissions from their travel?
  - Rewrite the person's story in the present time.
  - You can also complete the exercise through drama.
  - What impacts could different choices have on the person's own life and the lives of their family and friends? You can consider impacts on time use, social relationships, the economy, mental health...
  - And what impacts could the different choices have on society at large?
- Imagine a society where the increase in global average temperature has been limited to 1.5 degrees and where climate justice is realised.
  - Rewrite the person's story and set it in a climate-resilient world of the future. What could the person's situation be like in such a world? What could be different, and what could the person do? You can consider the required changes at different levels: culture and social norms, time use, values, availability of different modes of travel, prices...
  - You can also complete the exercise through drama.
- Make up new persons in different situations where they are about to board a plane. Write a short story about their situation and let your pair or group use it for the previous tasks. You can also complete the exercise through drama.
- From the perspective of climate justice, put the cases of the persons in an order of importance based on which one of them, in your opinion, has the best arguments for taking their trip by air. Whose journey is the least justified in your opinion? Justify your choices: which factors do you think the legitimacy of the trip depends on, and which in this case are the underlying values?
  - Values have been categorised in different ways, for instance according to whether they are centred on an individual or the community, and whether they aim for permanence or change. Values may include[25]:

prestige   **preserving a public image**   **success**

                    wealth   **ambition**   **pleasure**

enjoyment   **excitement**   **willingness to change**

creativity   **freedom**   **curiosity**   **independence**   **equality**

                    inner balance   **connection to nature**

health   **social justice**   **protecting the environment**

                tolerance   **love**   **friendship**   **helpfulness**

          responsibility   **respect for traditions**   **accepting your lot in life**

                    moderation   **respect for older people**

          obedience   **social order**   **national security**

family's safety   **impeccability**   **cleanliness**

          reciprocity   **togetherness**

Fact box

What does climate justice mean?

The impact of climate change on difference regions and population groups varies. Climate justice is underpinned by an understanding of how climate change has mostly been caused by the world's wealthy countries, which consequently bear the greatest responsibility for mitigating it and remedying the damage it causes. People who are the least responsible for causing climate change suffer from it the most, including poor populations, today's children and young people, and people born in the future.[26,27]

The concept of climate justice consequently describes climate change as an ethical, political and legal issue, in particular, rather than seeing it primarily as a natural science related problem.[26]

The advocates of climate justice call for global mitigation of poverty and changes in current economic systems and power structures.[29,30]

4. NARRATIVES OF AIR TRAVEL

This section takes a look at common justifications for not finding it necessary or desirable to reduce air travel and discusses the arguments for and against them. Such arguments often come up in public debate, and airlines also use them in their marketing. See below for examples of these justifications and narratives associated with air travel, or of how air travel is presented and which values are associated with it[23, 31]:

- Air traffic only accounts for approx. 3% of global carbon dioxide emissions. This is why it is more important and efficient to focus on reducing emissions in other sectors.

- Technological advancement, including improved energy efficiency, lower-emission fuels and electric aircraft, will cut emissions from air travel, which is why there is no need to reduce travel significantly.

- It is important that air fares are low enough and make flying possible for more and more people.

- Air traffic is important for job creation, and well-functioning air traffic maintains economic growth and consequently wellbeing.

- Many countries depend on air travel. Through tourism, air traffic drives economic growth and wellbeing in many developing countries.

- Air travel promotes interaction between people and different cultures, which is why reducing it is harmful.

Exercises

- Comment on the above statements in pairs or small groups. One person, or one half of the group, can also defend a statement, while the other argues against it. Later, they can change roles.

- Come up with similar arguments in favour of reducing or avoiding flying and climate-sustainable ways of travelling. In these statements, you can highlight problems associated with air travel or the benefits of avoiding air travel/choosing modes of travel with lower emissions than flying.

  - Write down your arguments and present them to your pair/another group.

5. HOW CAN EMISSIONS FROM AIR TRAVEL BE REDUCED?

The objective of this section is to find out about different ways in which aviation emissions can be reduced at different levels, from an individual's choices to policy instruments. It also discusses the impact of different methods and the ease or difficulty of putting them to practice.

By influencing prices, people can be encouraged to fly less

Several regulatory and market-based measures have been proposed to reduce emissions from air traffic, and some of them have already been taken. For example, air traffic within Europe has been within the scope of emissions trading since 2012. However, the effectiveness of emissions trading has been undermined by the fact that a large proportion of emissions allowances have been allocated to airlines free of charge, which means that carriers have little incentive to reduce their emissions. Kerosene (aviation fuel) is additionally tax free as a rule. Not taxing the fuel reduces the economic incentive to cut emissions.[2]

However, many countries have introduced or experimented with different taxes on air traffic. These flight taxes are paid by airlines or ultimately by passengers, as airlines can pass on the costs of the tax to ticket prices.[32]

Technological development is only part of the solution

The energy efficiency of aircraft has improved significantly, thanks to advancements in internal combustion engine technology. The amount of fuel aircraft consume per passenger kilometre is over 80% lower today than in the 1960s.[33] Renewable aviation fuels have also been developed and introduced, but their volume is still very low and only grows slowly. The development of electric aircraft has also progressed rapidly in recent years, and they can be deployed on short journeys in a near future. They will not make up for the current type of air traffic, however, as the aircraft are smaller and can only be used for short distances.[2]

The message of research evidence is clear: air travel of the current type is neither climate sustainable nor compatible with the 1.5-degree target. Rather than finding a single solution for reducing emissions from air traffic, however, changes are needed at a number of levels: in policy at national and international levels, business operations, available technology, individuals' travel decisions as well as cultural and social norms.[2,13,34,35] It has also been suggested that because the relatively small, wealthy share of population accounts for most of the emissions from air travel, the most effective solution would be to introduce measures that target these frequent fliers.[6]

Exercises

See the list of various measures aiming to reduce emissions from air travel below. Some of them have been tried or introduced in some form and somewhere in the world, while others have only been proposed. Rather than being exhaustive, the list contains examples of different actions.

Preparations: First, prepare the four-dimensional chart shown below on the ground, floor, wall or a large table. For instance, you can use string or masking tape, or draw the figure on a large piece of paper.

Print out the coloured labels on the next page and distribute them to the participants, or spread them on a desk or floor for the participants to see. Also cut out a few blank labels.

- Place labels with their actions in the four-dimensional chart based on two dimensions:
    1. How easy/difficult do you think it would be to put them into practice?
    2. Do you think that these measures would have a major or minor impact on reducing emissions from air travel?

- If you are not sure how easy or difficult a certain action would be to implement, you can place it in the middle. At the same time, you can discuss the factors which determine if a measure would have a high impact or if it would be easy to implement. You can also write your own suggestions for actions that could reduce emissions from air traffic on the empty labels and place them in the four fields.

easy to implement

small impact ← → big impact

difficult to implement
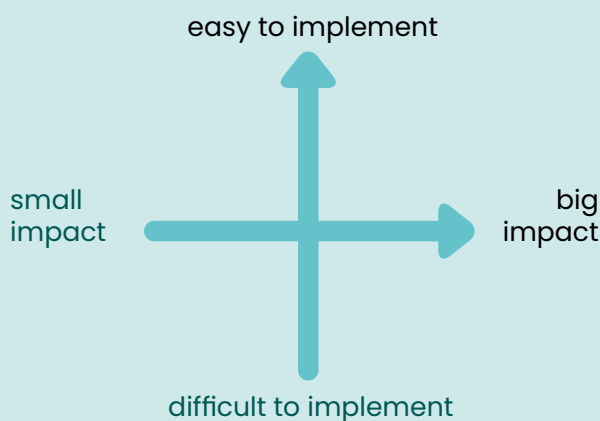
- There are no straightforward 'right or wrong' places for the actions in the four fields, as their impact and the ease of putting them into practice depend significantly on the way in which they are implemented. For example, while a low tax on aviation fuel is unlikely to reduce emissions from air travel as much as a higher tax, a low tax would probably meet with less resistance than a higher tax and could consequently be easier to bring in. Additionally, the impact of the tax would also be smaller if it were introduced by one country than if it were imposed in several countries. The measures interact with each other and affect each other's preconditions: for example, an increase in flight prices caused by an aviation fuel tax could lead to a reduction in air travel, which would make it easier to close down less profitable airports and routes.

- These interactions can be illustrated in the exercise by drawing arrows.

- Each person can place a few actions in the four fields, after which the topic is discussed, and others are allowed to move the actions to different fields. The idea is to justify why you have placed the action in a specific field.

- The purpose of the exercise is to illustrate the complex impact chains of different actions and to consider what their impact and acceptability depend on. At the same time, you can discuss what kind of information would be needed to assess the impact of the actions.

Influencing the cost of air travel

Introduction of a flight tax at national level

Aviation fuel tax at European level

Aviation fuel tax at global level

Reduction or elimination of State subsidies to airports and airlines

Pricing regime of tickets in which the price increases sharply if the same person buys more than one flight within a certain period of time

Mandatory emissions offset charge included in the price of a flight

Phasing out airlines' frequent flier schemes

Influencing the social norms and culture associated with flying

A ban or restrictions on fossil fuel advertising (would prevent or restrict airlines' and air travel organisers' advertising)

Reducing air travel capacity

Stopping the construction of new airports and expansion projects at airports

Reducing the utilisation rate of and departures from existing airports

Decommissioning certain airports

Facilitating alternative modes of travel

Developing booking systems to make it easier to plan and buy tickets for train, bus and cycling trips in different countries

Investments in rail traffic: increasing the number of departures using existing rail connections and building new rail connections in different countries

Recommissioning and reopening old rail connections and railway stations that have been decommissioned for passenger traffic

Investments in cycling tourism: cycle paths and routes, transport of bikes on trains and their storage at stations, marketing, services along routes...

Technological solutions and improving the efficiency of air traffic

Introduction of electric aircraft

Increasing the efficiency of air traffic, for instance by a better seat occupancy rate, optimisation of routes and air traffic control solutions

Increased use of renewable fuel in aircraft

Improving the energy efficiency of aircraft, reducing their fuel consumption per kilometre

Individual-level solutions and influencing society

Not travelling at all, or travelling by train, bus, bicycle, ship or a combination of these modes instead of flying

Flying less often and staying at the destination longer

Influencing travel with family/friends with the aim of avoiding or reducing flying

Influencing the travel practices of an educational institution or workplace, ensuring that air travel is not undertaken without a weighty reason

Sharing or producing social media content, for instance about travel by train or bicycle, or avoiding flying/ the climate impacts of flying

NGO activities for low-carbon travel

Organising or participating in demonstrations to spark debate on the climate impact of aviation

Political action: for example, exerting influence within a party for reducing subsidies for air travel and improving the conditions for low-carbon modes of travel

6. JOURNEY TOWARDS A CHANGE

This section discusses more extensively the possibilities of changing attitudes towards travel and the perceived need for travel as well as outlines a life without significant room or need for fossil fuel-based travel.

By powering aircraft, fossil fuels have 'shrunk' the world: it is possible to travel from one continent to another in a matter of hours. The opposite perspective could be 'enlarging' the world from inside out by paying more attention to how the setting of our daily lives and the inanimate and animate natural environments constantly link us to the entire planet in many ways.[36] Awareness of these connections and paying more attention to them can enrich life and add more dimensions to it.

The world comes to us in many ways: there are people around us whose roots or connections stretch around the world, and our everyday lives are full of influences from different parts of the world – flavours, music, books, news, videos, ideas, movies, celebrations, sports...

Individuals cannot bear the full responsibility for emissions from air travel or any other activity. This does not mean, however, that what the individual does and does not do would not matter. We all interact with other people, communities and organisations in many ways. Cultures, social norms and meanings, including those associated with travel, are undergoing a constant change to which everyone contributes in one way or another.

The ideas of sufficiency and downshifting have been seen as potential building blocks of low-carbon and also socially sustainable life[21]. These ideas are in many ways far distanced from the last-minute deals marketed by airlines and travel agencies, or short breaks from hectic everyday life.

As climate change advances, humankind will inevitably face major changes. Many current practices are on a collision course with sustainable planetary boundaries, and the impact of climate change is also felt in the tourism sector in many ways. Wellbeing that is sustainable from the perspective of the climate and environment is based on seeing the connections between humans and ecosystems. It has been suggested that sustainable wellbeing consists of the following areas: a reasonable standard of living, meaningful and responsible action, meaningful relationships and a living presence[2]. The current type of air travel, in which holidays taken by the world's wealthy population play a key role, is not easily compatible with ideas of sustainable wellbeing for all people in the world. To achieve a change, we need not only states and companies, but also changes in social norms and culture. Travelling less often, more slowly and to destinations that are less far away can have positive impacts on not only the climate but also people's wellbeing, and this is a change in which everyone can be involved.

Reflection and exercises

Pick one or more of the following questions and discuss them with your pair or in a small group. You can also complete this exercise alone by writing.

- Does our current culture support or facilitate a curious attitude towards and attachment to our local environments? Does the media feed them? Does the school encourage them?

- Do our minds tend to reach far away when it would also be possible to satisfy our curiosity without travelling to another country powered by fossil energy?

- Are there inspiring examples around you or in the publicity/media/social media of how you can live a rich life without travelling abroad at all, or by travelling over land, more slowly and not so far away?

- Could the ideas of sufficiency and downshifting change our attitudes towards tourism? What could society be like if the pace of life were less urgent, holidays were not about grabbing quick experiences somewhere far away, and everyday life were not stressful?

- How can you see your everyday environment 'through the eyes of a tourist'?

- Think about examples of places that are important for you in your local environment and that you would like to introduce to a visitor. What makes them meaningful to you?

- In your life, what examples are there of connections with different parts of the world that do not involve travelling? Think of the connections that are the most meaningful to you, give you joy and experiences, increase your understanding or satisfy your curiosity.

- What ways of 'travelling' without moving physically do you like?

- A thought experiment: how would the idea of personal emissions trading change travel? What would happen if every person living in this world had the same amount of emission allowances that they could purchase and sell to others?

- Make up ten new uses for an airport that has been decommissioned to achieve a low-carbon society. Also come up with new jobs for their employees.

REFERENCES

1: Lee, D.S., Fahey, D.W., Skowron, A., Allen, M.R., Burkhardt, U., Chen, O., Doherty, S.J., Freeman, S., Forster, P.M., Fuglestvedt, J., Gettelman, A., De León, R.R., Lim, L.L., Lunkd, M.T., Millar, R.J., Owen, B., Penner, J.E., Pitari, G., Prather, M.J., Sausen, R, & Wilcox, L.J. 2021. The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. Atmospheric Environment 244 (2021) 117834. https://doi.org/10.1016/j.atmosenv.2020.117834

2: Niemistö, J., Soimakallio, S., Nissinen, A. & Salo, M. 2019. Lentomatkustuksen päästöt – Mistä lentoliikenteen päästöt syntyvät ja miten niitä voidaan vähentää? Suomen ympäristökeskuksen raportteja 2/2019. Suomen ympäristökeskus, Helsinki. 66 s. http://hdl.handle.net/10138/292417

3: Statista 2023. Number of scheduled passengers boarded by the global airline industry from 2004 to 2022. (Visited 16.6.2023) https://www.statista.com/statistics/564717/airline-industry-passenger-traffic-globally/

4: ICAO (International Civil Aviation Organization) 2023. Post-COVID-19 Forecasts Scenarios. (Visited 22.5.2023) https://www.icao.int/sustainability/Pages/Post-Covid-Forecasts-Scenarios.aspx

5: Our World in Data 2023. Air passengers carried, 1970 to 2020. (Visited 22.5.2023) https://ourworldindata.org/grapher/air-passengers-carried?tab=chart&country=~OWID_WRL

6: Gössling, S. & Humpe, A. 2020. The global scale, distribution and growth of aviation: Implications for climate change. Global Environmental Change 65 (2020) 102194. https://doi.org/10.1016/j.gloenvcha.2020.102194

7: Akenji, L., Bengtsson, M., Toivio, V., Lettenmeier, M., Fawcett, T., Parag, Y., Saheb, Y., Coote, A., Spangenberg, J.H., Capstick, S., Gore, T., Coscieme, L., Wackernagel, M. & Kenner, D. 2021. 1.5-Degree Lifestyles: Towards A Fair Consumption Space for All. Hot or Cool Institute, Berlin. https://hotorcool.org/1-5-degree-lifestyles-report/

8: Atmosfair 2023. Calculate Flight Emissions. (Visited 22.6.2023) https://www.atmosfair.de/en/offset/flight/

9: UNWTO (World Tourism Organization) 2020. International Tourism Highlights. 2020 Edition. https://doi.org/10.18111/9789284422456

10: Alcock, I., White, M.P., Taylor, T., Coldwell, D.F., Gribble, M.O., Evans, K.L., et al., 2017. 'Green' on the ground but not in the air: pro-environmental attitudes are related to household behaviours but not discretionary air travel. Global Environ. Change 42, 136-147. https://doi.org/10.1016/j.gloenvcha.2016.11.005

11: Arnadottir, A., Czepkiewicz, M., Heinonen, J. 2021. Climate change concern and the desire to travel: How do I justify my flights? Travel Behaviour and Society 24 (2021) 282–290. https://doi.org/10.1016/j.tbs.2021.05.002

12: Barr, S., Shaw, G., Coles, T. & Prillwitz, J. 2010. "A holiday is a holiday": practicing sustainability, home and away. Journal of Transport Geography 18 (3), 474–481. https://doi.org/10.1016/j.jtrangeo.2009.08.007

13: Schubert, I., Sohre, A. & Ströbel, M. 2020. The role of lifestyle, quality of life preferences and geographical context in personal air travel. Journal of Sustainable Tourism 28 (10), 1519–1550. https://doi.org/10.1080/09669582.2020.1745214

14: Jacobson, L.; Åkerman, J.; Giusti, M.; Bhowmik, A.K. 2020. Tipping to Staying on the Ground: Internalized Knowledge of Climate Change Crucial for Transformed Air Travel Behavior. Sustainability 2020, 12, 1994. https://doi.org/10.3390/su12051994

15: Gössling, S. & Stavrinidi, I. 2016. Social Networking, Mobilities, and the Rise of Liquid Identities. Mobilities 11:5, 723–743. https://doi.org/10.1080/17450101.2015.1034453

16: Urry, J. 2012. Social networks, mobile lives and social inequalities. Journal of Transport Geography 21 (2012) 24–30. doi:10.1016/j.jtrangeo.2011.10.003

17: Gössling, S. 2019. Celebrities, air travel, and social norms. Annals of Tourism Research 79 (2019) 102775. https://doi.org/10.1016/j.annals.2019.102775

18: Gössling, S., Humpe, A. & Bausch, T. 2020. Does 'flight shame' affect social norms? Changing perspectives on the desirability of air travel in Germany. Journal of Cleaner Production 266 (2020) 122015. https://doi.org/10.1016/j.jclepro.2020.122015

19: Wolrath Söderberg, M. & Wormbs, N. 2019. Grounded – Beyond flygskam. Fores & European Liberal Forum asbl. https://fores.se/wp-content/uploads/2019/11/Grounded-Beyond-flygskam_Online.pdf

20: Büchs, M. 2017. The role of values for voluntary reductions of holiday air travel. Journal of Sustainable Tourism, 2017. Vol. 25, No. 2, 234-250. https://doi.org/10.1080/09669582.2016.1195838

21: Piispa, M. 2022. Liikkuvia utopioita, hidastamisen politiikkaa. Tutkimus nuorista liikkeessä ilmastokriisin ajassa. Akateeminen väitöskirja, yhteenveto-osa. Nuorisotutkimusverkosto/Nuorisotutkimusseura. Verkkojulkaisuja 172. https://helda.helsinki.fi/handle/10138/343477

22: *Gössling, S., Hanna, P., Higham, J., Cohen, S. & Hopkins, D. 2019. Can we fly less? Evaluating the 'necessity' of air travel. Journal of Air Transport Management 81 (2019) 101722. https://doi.org/10.1016/j.jairtraman.2019.101722*

23: *Gössling, S. & Cohen, S. 2014. Why sustainable transport policies will fail: EU climate policy in the light of transport taboos. Journal of Transport Geography 39 (2014) 197-207. http://dx.doi.org/10.1016/j.jtrangeo.2014.07.010*

24: *Doran, R., Pallesen, S., Böhm, G. & Ogunbode, C.A. 2022. When and why do people experience flight shame? Annals of Tourism Research 92 (2022) 103254. https://doi.org/10.1016/j.annals.2021.103254*

25: *Schwartz, S.H. & Bilsky, W. 1987. Toward A Universal Psychological Structure of Human Values. Journal of Personality and Social Psychology 1987, Vol. 53, No. 3, 550–562. DOI: 10.1037/0022-3514.53.3.550*

26: *Heyward, C. & Roser, D. (eds.) 2016. Climate Justice in a Non-Ideal World. Oxford University Press. Oxford 2016.*

27: *Mary Robinson Foundation 2022. Principles of Climate Justice. (Visited 22.6.2023) https://www.mrfcj.org/principles-of-climate-justice/*

28: *McDonald, S., Oates, C.J., Thyne, M., Timmis, A.J., Carlile, C., 2015. Flying in the face of environmental concern: Why green consumers continue to fly. J. Mark. Manag. 31, 1503–1528. https://doi.org/10.1080/0267257X.2015.1059352*

29: *Brulle, R.J. & Norgaard, K.M. 2019. Avoiding cultural trauma: climate change and social inertia. Environmental Politics 2019, Vol. 28, No. 5, 886–908. https://doi.org/10.1080/09644016.2018.1562138*

30: *Piispa, M. & Kiilakoski, T. 2021. Towards climate justice? Young climate activists in Finland on fairness and moderation. Journal of Youth Studies 25:7, 897–912. https://doi.org/10.1080/13676261.2021.1923677*

31: *Naukkarinen, O. 2006. Liikkumisen kulttuuri. Teoksessa A. Haapala & O. Naukkarinen (toim.), Mobiiliestetiikka. Kirjoituksia liikkeen ja liikkumisen kulttuurista, 12–38. (Kansainvälisen soveltavan estetiikan instituutin raportteja 3.) Helsinki: Erikoispaino.*

32: *Krenek, A. & Schratzenstaller, M. 2016. Sustainability-oriented EU Taxes: The Example of a European Carbon-based Flight Ticket Tax. FairTax Working Paper Series No. 01.*

33: *EASA, EEA & EUROCONTROL 2016. European Aviation Environmental Report 2016. DOI: 10.2822/38550*

34: *Gössling, S. 2018. Tourism, tourist learning and sustainability: an exploratory discussion of complexities, problems and opportunities, Journal of Sustainable Tourism 26:2, 292-306, DOI: 10.1080/09669582.2017.1349772*

35: *Gössling, S., Cohen, S, Higham, J. & Peeters, P. 2018. Desirable transport futures. Transportation Research Part D: Transport and Environment. Vol. 61, Part B, 301–309. https://doi.org/10.1016/j.trd.2018.01.008*

36: *Vihelmaa, E. 2021. Vähän enemmän vähemmän. Löytöretkiä kestävämpään elämään. Kirjapaja 2021.*

37: *Hirvilammi, T. 2015. Kestävän hyvinvoinnin jäljillä: ekologisten kysymysten integroiminen hyvinvointitutkimukseen. Sosiaali- ja terveysturvan tutkimuksia 136. Kela. 306 s. http://hdl.handle.net/10138/154175*