INTERNATIONAL AIR FREIGHT AND GLOBAL CLIMATE CHANGE

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EXECUTIVE SUMMARY

Report Objectives

This report is motivated by recent developments in the relationship between air freight and climate change. Climate change due to human effects is a long term phenomenon that threatens the global environment and economy. In committing to reduce emissions through climate change agreements such as Kyoto, United Nations Framework Convention on Climate Change, EU Emissions Trading, APEC, and bilateral agreements, countries are also committing their business communities. As much of the production of greenhouse gases is attributed to energy consumption, emission reduction will have a profound impact on energy-intensive industries such as international air freight. The processes used to reduce emissions will impact the fundamental assumptions of current business models.

- Air freight contributes substantially less than the 3.5% of aviation’s contribution to human-generated climate change. However, while international air freight is a small contributor in total greenhouse gas emissions, it has gained attention disproportionate to its contribution. Attention granted to air freight comes from concerns over the comparably higher emissions of aviation over other transport modes, the growth rate of aviation and air freight, and existing forecasts of future aviation emissions. Scientific uncertainty over the mechanisms of aviation impacts on climate change creates additional concerns.

- Regulatory risk is high through an increasing number of international and bi-lateral agreements on emission reductions. There are a wide variety of proposed mechanisms to control carbon emissions but no standard. Emissions trading, proposed carbon taxes, voluntary offset programs, are creating a patchwork of regulation. There are unresolved issues such as the allocation of international air emissions that will likely be included in future agreements. Consumer actions as food miles, boycotts, and the use of carbon labels will impact air freight on the demand side. Litigation risk through the use of class action lawsuits as a method to control climate change present an unknown level of risk.

- The debate over food miles, the distance food travels between source and point of consumption has focused attention on air freight. Supporters of food miles have initiated campaigns promoting regionalism and organic foods. Retailer Marks & Spencer has initiated “air freighted” labels on a selection of its food products and committed itself to carbon neutrality.

- Working with The Carbon Trust, UK retailer Tesco plans to use carbon labels on all its 70,000 products making supply chain carbon emissions of production, transportation and consumption increasingly transparent to consumers. Using its own Supply Chain Sustainability Scorecard, Wal-Mart will ask its electronics suppliers to evaluate their energy efficiency, durability and packaging and use the scorecard for purchasing decisions in 2008.

Together, these developments warrant concern over how the reality of climate change will impact the business of air freight. Against this background this report undertakes four key tasks:

- To assess how climate change will impact the business of air freight.
• To assess the state of current research specific to issues of air freight and climate change.

• To identify key consumer groups and their concerns regarding air freight and climate change.

• To gather opinions on the issues of air freight and climate change from representative industry members.

Report Findings

• Business risks run high. International agreements and country-level policies threaten to create a patchwork of regulation. However, the degree of commitment to climate change is uncertain. Consumer and retail industry action is under way that will create demand for detailed information about air freight emissions. The multiple business models in air freight (belly, all-cargo, integrated), its international nature, and the many commodity supply chains it serves, makes a unified industry response problematic.

• Lack of research. There are very few independent studies specific to the problem of air freight and climate change that could be used to inform industry action. Accurate data is necessary to create a climate change baseline, to identify areas for improvement and to demonstrate improvement. While the general topics of air transport and climate change are well researched, topics such as belly air freight emissions, life cycle analysis of key air freighted products, life cycle analysis methodologies for air freight, comparison of emissions across transport modes, routes and aircraft have received little attention.

• Carbon labels. While food miles and food labels generate a great deal of debate, carbon labels on consumer products are likely to have a greater impact on air freight as they are a more balanced approach to providing emissions information to consumers. 2008 will likely see implementation of carbon labels through UK retailers such as Tesco, generating further adoption. Labeling may be a point of differentiation amongst suppliers and retailers, so there are likely to be multiple standards rather than an international standard. If powerful retailers adopt carbon labels, they will push emissions information requirements back up the supply chain.

• Life cycle analysis. Life cycle analysis (LCA) is the generally accepted method of quantifying carbon emissions and other greenhouse gases and how it is applied will impact the perception of air freight. There is wide variation in the application of LCA, and no standards for application within air freight. There are very few LCA studies of air freight or air freighted products as well as little research on data, methods and interpretation standards for air freight LCA.

• Consumer groups. Industry associations such as the Soil Association, development NGOs such as Blue Skies, environmental advocates such as Greenpeace, government agencies such as UK’s DEFRA, as well as major retailers Marks and Spencer, Tesco and Wal-Mart are actively engaging air freight and climate change. Their activities are likely to increase and groups are working together to coordinate their actions working with suppliers and industry associations. While not anti-air freight, they appear to be concerned about the apparent lack of information and action from the industry.

• Interviews with industry members generally found little demand on the customer side for climate change action on air freight, although more demand in Europe than elsewhere.
Recommendations for IATA were to ensure some harmonization of standards, and to demonstrate industry action, and oversee a uniform approach to climate change. While most firms view climate change as a cost, some firms are viewing this as an opportunity for new products and services.

**Study Conclusion and Recommendations**

- **Research and measurement.** In order to meaningfully contribute to discussions of air freight emissions, to baseline performance, to identify areas of improvement, to inform best practices, to meet emissions requirements, there needs to be quality data specific to air freight. IATA should support research specific to air freight on critical topics: full logistics chain emissions; calculation of belly cargo emissions; LCA methodologies for air freight; incorporating value of goods into LCA; LCA of critical air freight commodities; best practices for emissions measurement and control; best practices for opportunities that will arise from climate change. Given IATA’s detailed work flow analysis through its e-freight program, research activities could build on this existing foundation.

- **Carbon information management.** Carbon labels and the use of life cycle analysis appear to be the direction for quantifying climate change impact. IATA should support the development of standards for data collection and measurement, LCA processes, and interpretation. IATA should consult with ICAO as well as governmental and non-governmental bodies to support standards consistent across the logistics industry and key manufacturing supply chains.

- **Inform the air freight community of developments.** With differences in perceptions of climate change impacts across regions, across products, a consensus on action will be hard to reach. Few firms are ready to engage climate change, most are waiting for international standards, customer demand, and clear and binding regulation. A significant problem for air freight is that with several business models some models are less able or willing to respond to climate change than others. A valuable service to the air freight industry for IATA would be reporting and informing constituents of recent developments, best practices, emerging standards, and facilitating discussion within the community. Communicating developments will also inform interested external parties and support an image of continuous action.
1. **How Climate Change Impacts the Business of Air Freight**

Climate change is an issue that is impossible for any business to ignore, and it was inevitable that air freight would be confronted with this issue. This report reviews the existing research on air freight and climate change and conducts interviews with key stakeholders to understand the situation that is facing the industry, what is being done and by whom, and identifying the key problems that need to be addressed in order to prepare industry participants for profitability in a carbon-constrained world.

1.1 Climate Change and Air Freight

Scientific evidence indicates that human activity is contributing to the warming of the planet through a buildup of greenhouse gases. Atmospheric levels of greenhouse gases have increased at an accelerating rate over the past century. The warming of the oceans will contribute to worldwide weather-related disasters, changes in growing patterns, and disease. In order to halt the buildup of greenhouse gases, scientists estimate that emissions worldwide must stop growing this decade and reduce by 60% by 2050.

While air freight is a small contributor in total emissions, it is the highest producer of greenhouse gases (GHG) in terms of grams/tonne-km amongst transportation modes. As it is the fastest growing segment of the transportation industry it is also the fastest growing in terms of total emissions (See Box 1). In a political environment concerned about efforts to lower emissions, it is almost inconceivable that there will not be worldwide regulation imposed in the near future to set targets and reduce emissions in air transportation, and consequently in air freight. In light of the irreversibility of climate change, it is likely that some of the economic benefits of air freight will be sacrificed to reduce the large negative economic externalities of climate change. In other words, regulation will be imposed without regard for the welfare of the industry.

The latest of the scientific studies provides convincing evidence that transportation has an impact on climate change across a variety of measures. The climate change impact of air transport is complex. While most discourse centers around carbon dioxide (CO2) emissions, there are many other significant emissions associated with climate change, such as methane, nitrous oxide, chlorofluorocarbons and particulates. Unlike rail, road, and ocean, air transportation has GHG emissions at both low altitudes surrounding airports and municipalities; at medium altitudes for domestic flights; and at high altitudes for long haul flights. Scientists believe that these emissions have different climate change impacts at different altitudes. At low altitudes, denser air requires higher fuel burn, and higher CO2 emissions. Surface emissions contribute to the warming of cities, generally about 5 degrees warmer than surrounding regions, and engage additional issues of air and noise pollution. At high altitudes, emissions are associated with increases in nitrous oxide, which leads to decreases in the stratospheric ozone layer. In 1992, aviation alone was estimated at 3.5% of the total warming (IPCC, 1999).

International air transport emissions are treated differently from other sectors and there is a lack of consensus how to allocate responsibility for international emissions. Air transport greenhouse gas emissions fall under the UNFCCC (United Nations Framework Convention on Climate Change). Only CO2 emissions are included in national emission totals for parties participating in the UNFCCC, therefore they are not subject to the emissions limits set out in the Kyoto Protocol.

Box 1. Air transport and Climate Change
Key facts about aviation and climate change:

- The most frequently cited estimate of aviation’s impact on climate change is that it is responsible for around 3.5% of climate change due to all human activities. (IPCC, 1992)

- IPCC has estimated future scenarios of aviation and climate change to 2050. The central case is that radiative forcing will grow to 5% of the total human contribution if no action is taken to reduce emissions, with the highest case at 15%.

- Contrails are thought to have a global warming effect, though less significant than either CO2 or NOx effects. Cirrus clouds that develop after contrails have been found to have a global warming effect in addition to contrails. The issues of contrails and cirrus cloud enhancement has increased, rather than decreased uncertainty of radiative forcing from aviation.

- Currently, greenhouse gas emissions from fuel consumption in international aviation are not accounted for in the first round of the Kyoto Protocol which covers only domestic emissions of CO2. ICAO is currently considering how these emissions may be incorporated into the second round of Kyoto.

- There is no realistic alternative to conventional aviation fuel, nor will there be one for the next 30 years and quite possibly longer (RCEP)

- From 1990 to 2003, the EU’s total greenhouse gas emissions fell by 5.5%. In the same period the CO2 emissions from international aviation of the 25 Member States rose by 73%, or 4.3% per year. In 2000, aviation in the United Kingdom was responsible for around 11% of the total UK climate change impact. United Kingdom forecasts suggest that the United Kingdom's combined domestic and international aviation emissions could account for up to a quarter of the United Kingdom's total contribution to global warming by 2030 (European Union- Twenty- First Report, 2006).

- In the UK the Department for Transport forecasts than by 2030, aircraft fuelled at UK alone, could have a global warming impact equivalent to 200-300 million tones of CO2 a year. (Davidson, 2005)

1.2 Characteristics of Air Freight that Influence Climate Change Response

There are unique characteristics of air freight that have implications for how issues of climate change might be approached by the industry:

- Air freight is not only airport-to-airport line haul. The air freight product is coordinated across many participants, both surface and air. There are many service quality dimensions to the air freight product, requiring different configurations of processes. Calculating climate change impacts of air freight requires identifying these different processes and their climate change impacts. From the point of view of most governments, air freight is air transport, and air transport means airlines. From the point of view of manufacturers, air freight represents one type of logistics service. From the point of most forwarders, air freight is one of several transport modes. Having several faces makes a uniform response to regulation or consumer demands difficult.

- Air freight business models. Air freight services are provided through the value chains of combination carriers, freighters, and integrators with physical processes. Within each business model there are a wide variety of services provided to meet the needs of
manufacturers and retailers. Different physical processes impacts the calculation of carbon emissions for the air freight product. In this sense, the variety of air freight products available complicates estimation of the climate change impact of air freight. While there will be common elements to each model, each business model also has its own distinct issues related to its physical processes.

- Air freight is a disaggregated industry. Air freight products are provided through the cooperative efforts of forwarders, airlines, warehousers, trucking, and potentially other third parties. An “air freight” industry response can be interpreted narrowly as an airline response, or as the response of all parties involved in the production of air freight products. Each party, however, will have its own climate change issues, and a coordinated air freight response will require a high level of cooperation.

- Air freight is just one link in the supply chain of products. As manufacturers and retailers attempt to reduce the carbon emissions of their total supply chains, their choice of transport mode will be a factor.

- Air freight plays a special role in the global economy. It carries goods of high value that make a significant contribution to GDP. On the basis of value, carbon emissions based on the value of goods shipped by air would be significantly lower than those of other modes. In developing economies, where the “ecological space” is high and there is little to no infrastructure, air freight allows perishable produce to be moved quickly to developed economies supporting trade and poverty reduction. The emergence of an international air freight sector brings developing countries into the global economy and is associated with higher per capital GDP.

- Air freight is not independent from the issues facing those larger industries. Because air freight is behind-the-scenes, perceptions of the climate change impacts of air freight are formed from perceptions of transportation and its large contribution to global warming, or from aggregate perceptions of highly visible passenger transportation.

Where a firm lies within the air freight supply chain will affect its perspective of climate change. While all firms will be affected by emissions caps or levies, should those arise, there are also opportunities that will be created by climate change. When air freight is perceived as just airport-to-airport, rather than the full value chain of activities, climate change appears to be just cost. When viewed as a value chain of services, new value propositions appear with potential for product differentiation. Those firms that are best able to coordinate their activities across their value chain are most likely to benefit from developing carbon-reduced products and services. However, these benefits will only appear when binding constraints are placed on emissions and consumers of air freight begin to consider carbon emissions when differentiating between products.

1.3 Risks Facing the Air Freight Industry

Typically, executives manage environmental issues as a problem of regulatory compliance, potential liability and pollutant release mitigation (Lash et al., 2007). Climate change is different because its effect is rapid, global, and long-term, causing irreversible harm. Consequently, actions are going to be taken that are global, permanent, and dramatic. A recent study identified airlines as one of the most susceptible to reputation damage due to climate change inaction (The Carbon Trust, 2005).
The short time frame and irreversible nature of climate change has created a sense of urgency for change. This has motivated fast action on the behalf of governments and consumer groups, as well as having become a popular political platform. This speed is creating a scenario where ad hoc policy actions are moving faster than firms can respond and leaves them little time to participate in discussions. Where should the air freight industry focus its energies? Given the need for a quick response, what should it respond to?

a. Regulatory Risk

Regulatory risk for air freight could take the form of regulating emissions for the transport element of the supply chain, across product supply chains, or both. Global agreements, such as the Kyoto Protocol, set aggressive targets for developed countries to reduce their carbon emissions and other GHG, and all companies operating with those countries will be affected by the agreements. While agreements such as Kyoto set targets, they do not specify how countries should reach these targets, therefore there are a variety of actions underway.

The EU and Asia are proposing the use of market mechanisms to control emissions. The EU emissions trading scheme will use a system of emission allowances and credits to meet the targets. The United Nations is targeting a long-term climate change agreement by 2009. While the U.S. withdrew from the Kyoto agreement, individual regions, states and municipalities are pursuing their own strategies to conform to Kyoto emissions targets. The U.S. is proposing agreement on a framework to reduce greenhouse gas emissions by 2008. The state of California, which has a history of leading environmental issues in the U.S., has set a target of returning to 2000 emission levels by 2010. Two hundred and twenty-seven U.S. cities have joined the Mayors Climate Protection Act committing their cities to meet the U.S. emissions reduction target in the Kyoto Protocol, independently of the U.S. federal government’s refusal to ratify the treaty.

The recent APEC meeting established a non-binding agreement for emissions reductions. While there are no teeth in this agreement, it may set the stage for the next round of UN meetings. Looking at the progression of developments and awareness of climate change, it would seem at this time that binding and enforceable emissions standards will be set in the near future.

Regulatory risk is high, and air freight will be affected by regulations that address general air transport without regard for the individual characteristics of air freight.

b. Litigation Risk

Because of the higher per tonne-km emissions of air freight over other modes, and the rising total emissions of air freight over passenger, air freight is a possible target for action. In assessing litigation risk, the industry and its members face a higher risk of lawsuits than other modes. Directors and officers of airlines and air freight forwarders may face personal liabilities if their firms are not perceived as acting on climate change. It has been suggested that litigation be used as a means of controlling climate change.

As an example, the Attorney General of California filed a case in September 2006 against six car manufacturers requesting damages for “future monetary expenses and damages as may be incurred by California in connection with the nuisance of global warming” (Salzman et al., 2007). It is anticipated that there will be a sharp increase in the number of climate change tort cases against private parties with potentially crippling costs for companies that fail to demonstrate responsible carbon management.
The recent US Supreme Court ruling that carbon dioxide is an air pollutant under the Clean Air Act, in a case brought by 12 US states, 4 local authorities and 13 NGOs is a strong statement that climate change cases will be taken seriously. In a majority judgment, Justice Stevens noted that “the harms associated with climate change are serious and well recognized, and that the “EPA does not dispute the existence of a causal connection between man-made greenhouse gas emissions and global warming” (Climate Justice Programme, 2007).

If air freight emissions are perceived as a threat to climate change, or if there is perceived inaction by the air freight industry, this may spur litigation. However, the more likely scenario is that litigation will be pursued against more visible passenger transport or against aircraft manufacturers, rather than air freight.

Box 2. Citations of Comparisons of Air Freight with Transport Modes

- “Every tonne of freight transported by air for one kilometer results in 0.6 kg of CO₂ emissions, compared to just 0.003 kg for ocean transport.” (GHG Transport, 2004)
- “Air transport compared to other modes of transport, such as driving or taking the train, has a greater climate impact per passenger kilometer, even over longer distances. It’s also the mode of freight transport that produces the most emissions.” (Air Travel and Climate Change, 2007)
- “The CO₂ emissions from rail freight are 20-100 times lower than for air freight and shipping is better still.” (RCEP, 2007)
- “In the UK GHG emissions from the air transport industry in 2000 were more than double those in 1990. Greenhouse gas emissions from the road freight industry rose steadily from 1993 following the recession in the early nineties with the 2002 emissions 48 per cent higher than 1990 levels. Greenhouse gas emissions from water transport showed little change through the early nineties, increased to a peak in 1998 only to fall back again the following year and ended the period up 29 per cent. Annual greenhouse gas emissions from public transport including taxis and minicabs were 7 per cent lower by the end of the period mainly as a result of lower emissions from buses and coaches.” (GHG Transport, 2004)
- “DEFRA estimates that 85% of the growing environmental and social effects of food transport is associated with freight movements on UK roads. In comparison, fresh fruit and vegetables air freighted from Sub Saharan Africa equates to less than 0.1% of UK greenhouse gas emissions.”(Sustain, 2006)
- “CO₂ emissions produced by rail and fuel use per passenger kilometer are typically an order of magnitude lower than for air travel. For journeys between 250 and 500 kilometers fuel usage on short haul flights is disproportionately high, largely due to the high rate of fuel burn required during take-off and initial climb.” (Rail and the Environment, 2004)
- “Short haul journeys by air can be up to three times more environmentally damaging than those by high speed rail in terms of their global warming impact due to the fact that aircraft deposit emissions much higher up in the atmosphere.” (Rail and the Environment, 2004)

c. Risk from Consumer Actions

Food-mile and eco-mile campaigns in Europe and North America are playing on concerns that the
distance a food item travels to the point of consumption is an indicator of its climate change impact. These campaigns generally advocate consumption of organic foods, support local farmers, show a preference for ocean freight over air freight, and support labeling produce to indicate the food miles associated with their production. Reports of the higher emissions of air freight over other transport modes (see Box 2) have fueled the food mile movement.

Several large retailers have adopted food labels to support the notion of food miles. Marks and Spencer as well as British supermarket chain Tesco have been reducing their air freighted products. Tesco has been restricting air freighted goods to no more than 1% of their imports. Marks & Spencer has committed to buy as much food from the UK and Ireland as possible and expanding their existing local supply networks.

Figure 1. CO₂ Intensity of Transport Modes

![Graph showing CO₂ emissions per tonne-km for different modes of transport]

Sources: Whitelegg, 1993; IPCC, 1996a; OECD, 1997a.

d. Risk of Modal Shifts

Evidence from studies that examine GHG emissions across transportation modes find that air freight, measured in grams of CO₂ emissions per tonne-km, has higher emissions than road, rail, or ocean (See Figure 1). In terms of aggregate total emissions, air emissions remain small, but are higher per tonne-km of shipments. These studies have been used to support arguments for a shift from air freight to ocean freight. However, these arguments are generally made within the important but limited context of air freighted perishable foods.

Improvements in ocean freight operations and technologies will reduce average transit time and increase the overlap between air and ocean services. In addition to price and transit time, climate change may an additional factor used to justify a shift from air to ocean. HP, on their website says that the company seeks “to reduce environmental impacts of our logistics network through a shift from air to ocean freight where practicable. Every tonne of freight transported by air for one kilometer results in 0.6 Kg of CO₂ emissions, compared to just 0.003 Kg for ocean transport.”

1.4 Air Freight Industry Actions

In an environment of increasing concern about climate change, the air transport industry
has not been static. Many airlines have invested heavily in renewing their aircraft fleets with younger, more fuel efficient and noise abating aircraft. Rising fuel costs have been a strong incentive for airlines to upgrade their equipment and adopt work practices aimed at reducing fuel consumption of aircraft on the ground and airborne. Airports have also invested in electric equipment to reduce fuel consumption on the ground. Pilot associations are adopting fuel saving work practices such as reducing the number of engines used in taxiing. Several airlines such as Cathay Pacific, Silverjet, Air Canada, Delta and British Airways are introducing voluntary carbon offset programs, instituting internal climate change programs and processes, and increasing communications with consumers and consumer groups about their environmental activities. DHL is introducing a carbon neutral product, GOGREEN, a voluntary carbon offset supplement for international express shipments.

1.5 Discussion

In examining the business impact of climate change on air freight there are several observations to be made.

Threats. Climate change presents two types of threats to the air freight industry. The first is that of external threats of emission controls through emissions trading, carbon taxes or some other means. These are most likely to have an impact at the firm level. A second threat is that of consumer action, placing upstream demands on the industry. This will have an impact on the air freight logistics chain and the manufactured product supply chain. The costs of developing and implementing processes to collect carbon emissions information will place a greater burden on less capitalized and less profitable firms. Some business models, such as belly cargo, have a more disaggregated structure than integrated firms. This will make shared information and a coordinated response to consumer demands more difficult than for integrated firms.

Opportunities. If carbon footprints are used to discriminate between logistics products, then climate change offers new opportunities for new value creation and higher profitability. New value propositions to customers of air freight, changes to the existing value chains to reduce carbon emissions, potential changes to cost structures and profit potential, and potential strategic differentiation through product offerings are possible. There are hints that such propositions are under way, and the increasing valuations of “green” companies suggest that this is a trend to follow.

Measurement. Measurement of GHG emissions throughout the air freight logistics chain will be a first essential step in managing carbon emissions. Measurement will enable a performance baseline as well as identify areas of improvement. Equally important, the processes by which measurement and feedback take place must be implemented in order to create a feasible system of control of carbon emissions. There are several standards including ISO 14000 that may be guidelines for such implementations. In general, these will favor larger organizations. Measurement and processes will enable the development of information networks. To the extent that carbon emissions are used by consumers to discriminate between products, or provide air freight firms with good carbon emissions data a competitive advantage, measurement may be an area of growth and opportunity.

Ambiguity and uncertainty about climate change. Because much is unknown about the science of air freight’s impact on climate change, the future regulatory actions, and the consumer responses to climate change, it is therefore difficult for the air freight industry to define the problem it is facing in order to develop an unambiguous response. One possible solution to this situation is to do a variety of things early in anticipation of future scenarios, rather than waiting for the problem
to become clear.

The situation analysis of air freight and climate change identifies many sources of uncertainty facing the industry. Information can help to resolve some of these uncertainties. Section 2 reviews the existing research on air freight and climate change. Section 3 summarizes actions of consumer groups. Section 4 reports the findings of interviews with key firms in the logistics chain. Section 5 discusses the findings of this study and recommendations.

2. **EXISTING RESEARCH ON AIR FREIGHT AND CLIMATE CHANGE**

In this section we review key academic and non-academic studies to understand the state of research on the business problems of air freight and climate change. This review does not do an assessment of the key air transport studies analyzing aviation emissions or attempt to estimate air freight emissions from general air transport numbers. That there is an impact of air freight on climate change is not in dispute, our interest is in what information is available to inform an industry response.

A first finding is the shortage of research. In locating materials for this review, we searched major databases covering scholarly and popular publications (ProQuest, Lexis Nexus, etc.), citation indexes (Web of Science), transportation specific databases (TRIS), as well as locating materials online. To illustrate the lack of research, we examined ProQuest, a database covering over 9,000 scholarly journals magazines, trade publications, newspapers, reports and dissertations. A scan reveals large holes in key areas. (See Table 1)

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This section is organized around several key topics. Food miles are one of the most hotly discussed topics and influential in perceptions of air freight. Life cycle analysis is essential for measuring emissions of air freight and air freighted products. Modal comparisons are often cited in discussions of shifts from air to ocean. Best practices and green logistics are areas that will continue to grow.

2.1 **Food Miles**

Food miles are a topic that has generated a great deal of controversy. Concern over the distance food travels from source to consumer can be traced to a report by the SAFE Alliance (now Sustain) in 1994 (Paxton, 1994) and a second SAFE report in 1999. The two reports raised concerns over the trend of increasing distance food travels between source and point of
consumption, linking transport distance to climate change, excessive packaging, reduced agricultural diversity, and rural farm closures.

The concept of food miles drew much attention in the UK, leading to a seminal report commissioned by the UK Department for Environment, Food and Rural Affairs to consider the use of food miles as a key indicator for sustainable development (Defra, 2005). The report was commissioned to compile an historical food miles dataset, identify factors affecting food miles in the UK and overseas, identify the economic, environmental and social impacts of food miles, and to develop a set of key indicators relating food miles to sustainability. While this report was an exploratory report, its finding legitimized and accelerated the use of the term food miles in promoting organic foods and regional farming, as well as more debate about the role of food miles in sustainability and climate change.

There are two key findings of the report that have been particularly influential in the discussion of air freight and food transport. The first is the role of air freight in food miles. The second is the use of the food miles indicators.

The study finds that air freight has the highest CO₂ emissions per tonne, estimated at 11% of UK total food transport CO₂ emissions, with long haul air freight the dominant factor (10%). The high growth rate of air freight was a concern of the study. The data used to support these findings drew upon aggregate national air transport statistics and a set of assumptions in order to estimate the air freight component of emissions. International air freight miles for food categories were estimated as straight line distances between London and the capital city of each country. CO₂ emissions were estimated using an earlier study by Defra (2002) to estimate emissions.

A second finding of the study is that a single indicator based on total food kilometers is an inadequate indicator of sustainability. Instead, a “suite” of indicators is proposed to better capture the data required to address sustainability of UK food systems: urban food km, heavy goods vehicles food km, air food km, and total CO₂ emissions. The report notes that “great care must be exercised in interpreting any changes observed in the indicators or in the setting of any associated targets. It will be important to establish the underlying causes and statistical significance of any changes and to consider all the economic, social and environmental implications before drawing conclusions or formulating policy responses” (DEFRA, 2005: vii).

In response to the Defra (2005), there have been a number of actions taken by consumer groups building on the report. There have been several national and regional food mile awareness campaigns primarily within the UK, e.g. Farmer’s Weekly food miles campaign. M&S initiated the use of “air freighted” labeling on its products as of March 14, 2007, starting with 20 products and planning to extend the labeling to 130 products by the end of 2007.

The food mile controversy is highly politicized. Given the serious implications of food miles for trade and poverty reduction, many development organizations have become involved. IIED, a non-profit organization, argues that 40% of air-freighted fruits and vegetable imports to the UK are from sub-Saharan Africa (SSA), and that UK consumers spend over one million pounds per day on this produce. Per capita, SSA countries have considerable reserves of “ecological space” compared with industrialized countries, and have poorly developed infrastructures, which make them eligible for the use of air freight to reach the markets of developed countries.

Studies around the world have criticized the use of food miles as a proxy for climate change impact. A Canadian study found that the high transport miles associated with organic foods canceled their production benefits (Food Production Daily, 2007). A New Zealand study
contested UK claims over the emissions of kiwi fruit exports, with NZ politicians claiming food miles are often a “thinly disguised appeal for self-interested protectionism” (AP-foodtechnology, 2006). Fonterra, a New Zealand dairy co-operative operating in 140 countries responded to UK-based Dairy Crest’s food miles campaign as a “silly” concept that “will blow itself out very quickly” (Dairy Reporter, 2006). In Kenya, already concerned by UK plans to reduce Kenyan flower imports, food miles have taken a new turn and entered the tourism sector through the introduction of “tourism miles” (Business Daily, 2007).

In response to concerns that food miles focus will disproportionately harm farmers in developing countries, particularly sub-Saharan Africa, UK government departments DfID (Department for International Development) and Defra released a joint statement on food miles (DfID, 2006). The statement reads “Food miles alone, or the distance food has travelled is an incomplete way of judging whether the food we eat is sustainable.” Furthermore, “Research shows that “food miles” is a misleading concept because it over-simplifies a complex set of issues and trade-offs.” Given the key role Defra played in the initial development of the food miles concept, this would seem to be a retraction of support for the concept.

While food miles will continue to generate discussion because of its simple message and the backing of organic and regional farming organizations, elsewhere the concept of carbon labeling is gaining traction, with different implications for air freight. Carbon labeling extends beyond the small percentage of air freight that is perishable foods into a much wider range of consumer products and requires detailed data to calculate the emissions at each stage of the product life cycle.

There is strong evidence that the discussion has moved away from food miles towards carbon labels and full life cycle analysis of products. The UK government in its 2006 Food Industry Sustainability Strategy considers environmental costs across the life cycle of produce, not just in the transportation component. The UK government is also working with government funded consultancy The Carbon Trust and BSI British Standards to introduce a benchmark for measuring carbon emissions to enable retailers to label foods. A pilot program is running with several UK companies: Boots Botanics, Walkers crisps, Innocent smoothies and Ingredients shampooers. Tesco, Britain’s largest retailer, has committed to calculating the emissions involved in the production, transportation and consumption of all its 70,000 products and reporting them on carbon labels (Branigan et al., 2007).

At this time we find little interest in food miles or carbon labels in the U.S., although an early study by the Leopold Center for Sustainable Agriculture at Iowa State University considered “transportation environmental impact” ratings on “ecolabels” (Raloff, 2003). Notably, the U.S. study of ecolabels also recommends a full life cycle approach (Heller and Keoleian, 2000).

A life cycle approach is consistent with the recent actions of Wal-Mart, the world’s largest retailer. Wal-Mart (2005) has announced plans to reduce GHG emissions by 2% by 2012. As part of its overall climate change strategy, Wal-Mart will assess the carbon footprint of its supply chain and request service providers to audit their environmental impacts. Using a Supply Chain Sustainability Scorecard, Wal-Mart will assess its logistics providers based on an environmental assessment of equipment, operations, facilities, and corporate commitment. “The scorecard will evaluate electronics on energy efficiency, durability, upgradability, end-of-life solutions, and the size of the package containing the product” (Wal-Mart Facts, 2007).

**Remarks**
After reviewing the research on air freight and food miles, we make the following observations:

- Food miles, and air freight and climate change are two separate discussions. Food miles is focused on the small perishable segment of air freight, backed by organic and regional interests, with only a tangential unscientific argument that “distance is bad” for climate change. Because, at the governmental level, the aims of food miles are in direct conflict with the aims of international development, government support for food miles is likely to wane in favor of more balanced approaches. The joint detraction of support by Defra and DfID is a significant indicator.

- Interest in the issues of local food access, congestion, and distribution will continue in part because of the simplicity of the food miles message, and partly because of the continued backing by vested interests, particularly organic and regional farming associations worldwide. However, this discussion is likely to be marginalized and the impact on the reputation of air freight is likely to be minimal.

- Carbon labeling is likely to have a much bigger impact on air freight. This extends beyond food produce to all products and intermediate products. Carbon labels are likely to be adopted widely, given their recent support by Wal-Mart and Tesco. Carbon labels will place data requirements for emissions data back up through the logistics chain through forwarders to warehousers to airlines and airports.

In order to calculate carbon emissions, life cycle analysis is the most widely accepted method. We turn our attention to studies of the application of life cycle analysis in air freight in the next section.

**2.2 Life Cycle Analysis**

Life cycle analysis (LCA) is a generally accepted method of quantifying how much energy and raw material is used during the stages of a product’s life cycle, and how much waste, including emissions are generated during the process. LCA is sometimes referred to as cradle-to-grave analysis, life cycle inventory, life cycle assessment, eco-balancing, or material flow analysis. In general there are two stages to an LCA, data collection and interpretation of results.

In principle, LCA is an agreed-upon process for the estimation of environmental impacts including carbon emissions. There are several dimensions that can greatly affect the outcome of an LCA. One dimension is how to define what is “cradle” and what is “grave” in an LCA. The scope of the analysis defines what elements of the production processes are included in the analysis. In the context of air freight, the scope could be just airport-to-airport and the air freight processes within those bounds. Or, the scope could be the total product supply chain in which air freight is used. The scope could also be extended even further by including reverse logistics and empty miles.

There are two primary types of LCA methodologies: process-based and economic input-output. Process-based LCA views the production of a good or service as a collection of sequential processes. Each process consumes resources (e.g. energy, water) and creates environmental impacts (e.g. emissions, discharges, accidents). The result of a process-based LCA is the summation of each of the elemental processes. The advantage of the process-based approach lies in its level of detail and specificity to a firm and product. However, this type of model has heavy data requirements, as well as being time consuming and costly, especially when the scope of the
LCA is large. Most often firms track materials and energy in monetary terms rather than mass and energy units, making data collection difficult and subject to error.

Economic input-output modeling (Hendrickson, 1998) has less rigid data requirements than process-based LCA. The input-output approach links environmental data to monetary input-output tables, allowing purchased materials, energy and services to be specified only in terms of monetary value. The advantages of this approach are convenience, speed, comprehensiveness, and consistency. The primary disadvantage lies in the high level of aggregation, making it ineffective at the company level of analysis (Junnila, 2006).

Hybrid models attempt to combine the advantages of process-based and economic input-output LCA. The hybrid model reduces the data requirements of the process-based analysis, and provides a higher level of specificity than the economic input-output analysis.

Facanha and Horvath (2006) provide a hybrid LCA comparing air emissions (CO₂, NOₓ, particulate matter, and carbon monoxide) associated with rail, road and air freight transportation in the U.S. domestic market. The study does not include “first” and “last” miles, nor warehousing, focusing instead on infrastructure (Table 2). The scope of the study does not differentiate between commodities as it is based on national aggregate statistics. Air emissions are estimated using ton-miles which enables comparison across modes. The authors note that a similar analysis could be done using value of goods as the base measure, better reflecting the economic benefits of the three modes of transport. The study finds that air freight is the least efficient in CO₂ emissions in terms of grams/ton-mile, 35 times higher than rail, 18 times higher than road.

The authors note some difficulties of interpretation of their results. A first is that this analysis reflects a broad treatment of all sectors. Air freight has several different business models that are treated as one in this assessment. A second is allocation between belly cargo and passengers on scheduled airlines. A third is the wide regional variation in air freight characteristics.

A second study by Williams (2007), takes a significantly different approach in its LCA to compare the GHG emissions of cut roses produced in Kenya and in the Netherlands for the British market. The scope of the LCA includes all the energy and resources used in the production and delivery of the commodity product. The emissions traced are CO₂ and Global Warming Potential. For air freight fuel usage and emissions, the study starts with data from Defra (2005) and the UK National Air Emissions Inventory and makes estimates of aviation emissions using multipliers for radiative forcing, aircraft manufacture and maintenance. The author notes that the emissions values for air freight are the same as Defra (2005), but may differ from actual those actually used in Kenya and Europe.

The study concludes that the production of cut roses from Kenya produces less emissions than those from the Netherlands. The Kenyan operation emits 2,200 kg of CO₂, while the Dutch operation emits 35,000 CO₂, a factor of 16 times that of Kenya.

### Table 2. Adapted from Facanha and Horvarth (2006)

<table>
<thead>
<tr>
<th>Geographical Scope</th>
<th>Continental United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Assessment</td>
<td>CO2, NOX, PM10, CO</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Impact Assessment</td>
<td>Excluded</td>
</tr>
</tbody>
</table>

**Vehicle Life-cycle Phase**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Manufacturing</th>
<th>Use</th>
<th>End-of-Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manufacturing of aircraft</td>
<td>Aircraft emissions</td>
<td>Dismantling, shredding, separation and disposal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrastructure Life-cycle Phase</th>
<th>Manufacturing</th>
<th>Use</th>
<th>End-of-Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway construction</td>
<td>Runway maintenance</td>
<td>Recycling or disposal of runway materials</td>
<td>Decommissioning of terminals not included</td>
</tr>
<tr>
<td>Airport cargo terminal construction</td>
<td>Electricity, deicing</td>
<td>EPA (2000) [needs to be added in the references]</td>
<td></td>
</tr>
<tr>
<td>Port of Seattle (2005)</td>
<td>Airport operations</td>
<td>EPA (2000) [needs to be added in the references]</td>
<td></td>
</tr>
<tr>
<td>BTS (2004) [needs to be added in the references]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fuel Life-cycle Phase</th>
<th>Manufacturing</th>
<th>Use</th>
<th>End-of-Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum refining and distribution</td>
<td>Included in vehicle use</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Variety of sources, treated as mode independent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

LCA is a tool for assessing and comparing the environmental impact of a product or service throughout its lifespan. A complete LCA is a lengthy and detailed process, requiring a large amount of data. An implicit assumption in performing an LCA is that emissions data is available, and the quality of the data is reliable, meaning current, accurate, and specific. In the case of air freight, many numbers used in the studies we examined were estimated from aggregate transport data not specific to air freight. There can be significant variation in aggregate numbers. For instance, examining one key figure for air freight, grams of CO\(_2\) emissions per tonne-km of freight, we found significant variation (Table 3).

Given that much of the air freight data comes from processes of estimation the process of estimating such data should be uniform across carriers in order to allow comparisons. For instance, the portion of aircraft emissions on combination carriers that is due to belly cargo. Our interviews indicate that there are not standard practices at this time, some airlines are questioning how to estimate what portion of the aircraft emissions are attributable to freight or passenger operations for belly cargo given the configuration and surface operations of the aircraft.

The scope of an LCA can have a significant impact on the outcome and interpretation. As the two studies reviewed demonstrate, a narrow scope examining airport-to-airport operations yields a negative view of air freight, while a broader scope that examines the supply chain of a product yields a favorable view of the air freight logistics chain. It also suggests that across different product categories and regions, different results may be obtained.
One purpose for performing LCA is to enable comparisons. In order to be effective in this regard, common methods need to be used. EU (2005) recommends consideration of different EU and international LCA models to best calculate growth and emissions projects for air transport as well as for other sectors of the economy and their underlying assumptions. This suggests that when considering models for air freight, models used in other sectors should also be examined and considered.

Table 3. Average Amount of CO₂ per Tonne-km

<table>
<thead>
<tr>
<th>Source</th>
<th>CO₂ per tonne-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Airways (1996)</td>
<td>795g</td>
</tr>
<tr>
<td>Whitelegg (1997)</td>
<td>1206g</td>
</tr>
<tr>
<td>IPCC (1996)</td>
<td>1642g</td>
</tr>
</tbody>
</table>

Source: Simmons 2000.

2.3 Impacts of Climate Change on Air Freight

In addition to the work on how air freight impacts climate change, there is a nascent body of work that hypothesizes how changes in climate will affect freight transport in the future. Rising temperatures, changes in weather patterns, intensified weather related disasters, rising sea levels are factors that are expected to impact freight transportation infrastructure. Caldwell et al. (2003) present a preliminary scan of potential impacts of global climate change on freight transport, focusing on implications for physical facilities and infrastructure, and changes in patterns or demand for the shipment of freight. The study, restricted to the U.S., suggests that airports on both coasts will be threatened by rising sea levels as well as feeder road infrastructure. Changes in weather patterns will affect the sourcing of materials and supplies. The trend towards reducing uncertainty around the time of delivery creates potential for costly disruptions in freight transportation, a particular consideration for air freight. Other climate change studies have examined the impact of weather patterns on farming patterns, and therefore where produce is sourced globally, with implications for the supporting air freight infrastructure.

2.4 Discussion

In reviewing the literature specifically related to air freight and climate change we find that there is little research in this area, in spite of the large body of general air transport and climate change research going on. Why is this area so understudied? Historically, air freight has been an area with little research, and dominated by airline passenger transport. In part this is due to the U.S. coming late to the realization of the significance of logistics. Clearly, in the context of air freight, in order to defend itself as a business system and to increase its carbon efficiency more research that reflects both expertise in climate change and in air freight needs to be developed.

The research we found highlighted two major themes: food miles and life cycle analyses. These two topics frame a more general trajectory of the development of a control system for climate change, which is why we believe that carbon labels, rather than food miles will be the successful
model for consumer information. External factors such as cap-and-trade systems, food miles and carbon labels are pushing the industry towards gathering and sharing more information about carbon emissions. While food miles created awareness of the emissions of air freight, the food miles message is stymied by embedded political messages and conflicting interests. However, carbon labels appear to be purely informational, although the process of estimation and collection will be political. In order for any carbon constraints to work, the first step will be measuring the carbon emissions of systems. For compliance with national regulations carbon emissions will be reported at the firm level. For satisfying consumer expectations carbon labels appear to be the most likely form of reporting emissions across the supply chain.

The collection of carbon emissions data is the first step towards creating a carbon emissions control system for air freight. The degree to which penalties are associated with excessive emissions will determine the rigor of organizational and inter-organizational carbon control systems. The greater the penalties, the more investment will be made in developing systems. ISO 14000 is one method that some firms are using to guide development of environmental management systems. ISO 14064 lays out guidelines for the reporting of GHG. These lay the foundation for the collection of data in organizational GHG inventories.

When viewed as an information and control system, there are several observations that can be made about carbon control systems and the air freight community. A first is that while collection of emissions data will be expensive, the major difficulty with this first step will be changing work practices within the industry in order to get the data. This could be a profoundly difficult step. Organizationally, the integrators have a significant advantage in this regard, with greater capitalization and flexibility.

With data in hand, a carbon system would enable measurement and feedback throughout internal processes in order to reduce or maintain emissions levels. The degree to which this is important once again depends on the incentives. With no incentives, these systems will be just for show, and expensive. If the incentives are powerful, these systems will shift towards being strategic, just as reservation systems shifted from being back office to strategic information systems.

Life cycle analysis has been adopted widely as a method for combining emissions data to establish the environmental impact of products. Our brief review indicates that in the context of air freight, there is much work to be done in the areas of data collection, methods and interpretation. Historically, much of the work in life cycle analysis has been done in the environmental sciences. Given the complexity of the air freight supply chain, and the importance of understanding the air freight context in applying life cycle analysis, much inter-disciplinary work needs to be done in order to adapt life cycle analysis into a process that can reliably inform business decision-making in air freight.

3. **Actions of Consumer Groups**

Consumer group actions will help to shape the ongoing dialogue on climate change and air freight through the impressions they create regarding air freight, such as in the food miles debate, and through their actions, such as boycotts or the use of labels. This section summarizes the actions of the main consumer groups concerned with air freight. The information was gathered through a literature search as well as interviews with key consumer groups such as Blue Skies and the Soil Association. Table 5 presents a brief summary of the key consumer groups.

3.1 **Key Issues**
From our review of consumer groups, we found several themes in their concerns related specifically to air freight.

- Concern is directed at air freight because of its faster growth than passenger transport; the use of older fleets for all-cargo with apparently higher emissions; and the low profitability of cargo inhibiting upgrading fleets.
- There is the perception of a lack of action by the industry establishing clear directions for dealing with global warming or actions to improve emissions performance.
- There are concerns about the accuracy of GHG emissions data, such as levels at different altitudes, latitudes, seasons and temperatures.
- The allocation of emissions for international air freight and air transport in general.

3.2 Consumer Groups Actions

Several firms have started labeling air freighted products, using carbon emissions labels, or setting carbon offsets. These initiatives represent the consumer “demand” side of the equation for climate change.

Marks & Spencer, operating 650 stores (400 UK, 150 worldwide) has implemented “air freighted” labels on food products (Environmental Leader, 2007). Tesco, the UK’s largest retailer, is seeking to establish a common measure of the carbon footprint of products and is seeking to establish a Sustainable Consumption Institute towards this end. They are restricting air transport to less than 1% of the products and using an airplane symbol to identify air-freighted products (Tesco, 2007). Acknowledging the difficulty in developing quality information for labeling, Tesco is putting £5m into the Sustainable Consumption Institute, working with Oxford University’s Environmental Change Institute to develop carbon labels for its approximately 70,000 products.

Consumer organizations are still developing their approaches to air freight. In our interview with the Soil Association, which initiated some discussion on food miles through its air freight green paper, it was pointed out that green paper was intended to bring people together to discuss impacts of air freight on climate change not to ban air freight. Organizations are also cooperating and consulting with each other on issues associated with air freight. For instance, the Soil Association hosted a conference on air freight with over 100 delegates including Greenpeace, Blue Skies, Airport Watch, the UN International Trade Centre and others.

Organic Farm Foods are the largest specialist supplier of organic fresh fruit, principally supplying Tesco and Sainsbury in the UK. They aim to reduce air freight as a means of transporting products to the UK, having reduced the use of air freight from 21% in 2000, to 3%. Air freight is currently used to full supply gaps in the market, and support new source and volume development. They have cooperated with universities to develop packaging, handling and transport protocols and invest in new technologies to enable use of ocean and road transportation. (Soil Association, 2007).

Blue Skies employs over 1,500 people in Ghana and 700 employed in factories in Egypt, South Africa and Brazil. Its customers include supermarket chains in the UK, Europe and South Africa. Their position is that air freighted products are the only solution for many of their products, and that their farming produces very little carbon footprint with no tractors, roads, or emissions in contrast to developed countries. Forced into the discussion of food miles, climate change and air freight, they have engaged in the life cycle analysis of several of their produce in order to defend
their air freight practices.

The Carbon Trust is an independent company funded by the UK Government with its board comprising a cross section of the economy. Its actions related to air freight are embedded in its larger program aimed at promoting a low carbon economy in the UK. Carbon labels are only one of the solutions offered by The Carbon Trust. Behind the carbon labeling lies the development of processes to enable businesses to estimate their carbon emissions, and take action to reduce emissions.

The Soil Association is a UK based organization with about 25,000 members. It’s contribution to the food miles debate is documented elsewhere in this paper.

3.3 Discussion

The organizations identified in this section are taking action specifically related to air freight. However, it is important to acknowledge that these actions are taking place in a much larger community of organizations raising awareness and pushing for action on climate change which will create more pressure for the industry to appear responsive.

There is not always consistency in the approach of these organizations. While food miles are pushed by local and organic food groups, international development organizations such as Blue Skies are pushing back. While Marks and Spencer labels with air freight, Tesco is considering carbon footprints for product supply chains. The inconsistencies in the actions will create pressure for action, and yet not yield clear solutions.

Collaboration and consultation across organizations on air freight suggests that climate change is viewed not as a local territorial issue, but as a common issue by these organizations. The combined effect of these organizations could have a serious impact on awareness of air freight.

4. INTERVIEWS WITH INDUSTRY STAKEHOLDERS

We conducted interviews with firms across the logistics chain of air freight including. The interviews are still under way and these are preliminary comments. The interviews were intended to gather opinions and insights into the issue of climate change and air freight. These interviews do not constitute, nor were intended to constitute a statistical sample. It is a non-statistical sample including airports (1), airlines (4), forwarders (2), integrators (2), and third parties (2). The firms we spoke to were highly capitalized, and represented Europe, Asia, Middle East, North America as well as across the air freight logistics chain. The participants were environmental managers, managing directors, vice president, and directors. We describe below the major themes that came through in these interviews.

Demand for climate change action. Of the interviews that we conducted, we found very little evidence that climate change is demand driven at this time. While one European-based airline indicated that about 10-15% of their forwarder customers enquired about climate change initiatives, and an integrator had a few customers who raised environmental issues, firms did not see a demand for products, services or certification. While most indicated that there would be more concern about climate change in the future, there was no consensus on where the pressure would come from or the time frame. Some felt it was not an issue at all, others felt it was a European issue only.
Perspectives on climate change. There were as many perspectives of climate change as people interviewed. Not surprisingly, airlines, forwarders, and integrators had very different takes on climate change.

Airlines indicated they felt very little to no pressure from agents on climate change, with one exception who mentioned that the cargo industry is facing a lot of pressure from shippers. Two airlines have implemented ISO 14001, and are tracking information relevant to climate change such as emissions, fuel consumption, hours of flight, and performance indicators. In contrast, one airline said that certification such as ISO 14000 would reduce flexibility and the airline didn’t maintain an environmental committee.

Forwarders had highly diverging comments on climate change. One North American firm saw little interest from shippers, little pressure to act on climate change, little interest in ISO 14001, and no impact of climate change on the air freight industry in the short term. Another, a European firm, has 14001 approval, indicated about 10 to 15% of customers enquire about climate change initiatives, however they don’t see climate change as having a major impact on their business. The firm expressed a need to provide information to customers to make informed decisions, but didn’t measure CO2 emissions, and expressed concern about the cost of tracking emissions data.

Integrators indicated that few customers have raised environmental issues however they were more active than either forwarders or airlines. Customers had their own climate change goals and were seeking partners in their supply chains to work with them. They felt that expectations of more conditions 14001, 18801 and other initiatives would increase in the future. Innovations included a carbon neutral express product, and developing an information system to allow customers to custom design their logistics to suit their needs.

Cooperation with third parties. There were two firms that were working with third parties on climate change. One airline indicated that they intended to start working with an environmental group in the future. An integrator was working with a third party in developing its life cycle analysis systems as well as working with ICAO.

IATA’s role. The interviewees were asked what they thought IATA’s role in climate change should be.
- IATA shouldn’t respond to food miles. Taking one side or another in this debate would estrange either local businesses, big agri-business or producers in developing countries.
- IATA could ensure that there are not multiple levels of ecological standards imposed on the air freight industry. This could be a “nightmare” for the industry. IATA could oversee a uniform approach to climate change.
- Standards. Several interviewees indicated that IATA could assist in establishing standards for the industry, although which standards were not specified.
- Demonstrate how the industry is being effective. Show the public, as well as industry constituents, what the industry is doing, and that it is responsible and accountable.

Standards. Several firms had implemented ISO 14001. With respect to air freight in particular, it was expressed that for forwarders, who are generally not air freight only, specific air freight standards would be difficult, although there were some common elements such as storage and warehousing. One forwarder voiced the concern that the cost of certification is prohibitive and the customer does not want to bear the cost of the certification.
**Potential research areas.** Most air freight revolves around the hub and spoke system. One interviewee suggested examining the hub and spoke to see if this is consistent with reduced emissions. Several airlines mentioned how to estimate belly freight emissions on combination carriers. One airline questioned whether newer aircraft really had significantly lower emissions than older aircraft given that most fuel burn takes place during takeoff and landing. Several airlines expressed concern about the cost of collecting emissions data.

5. **DISCUSSION AND RECOMMENDATIONS**

- Measurement. In order to meaningfully contribute to discussions of air freight emissions, baseline performance, identify areas of improvement, inform best practices, and meet emissions requirements, there needs to be quality data specific to air freight. IATA should support research specific to air freight on critical topics: full logistics chain emissions; calculation of belly cargo emissions; LCA methodologies for air freight; incorporating value of goods into LCA; LCA of critical air freight commodities; best practices for emissions measurement and control; best practices for new opportunities. Given IATA’s detailed workflow analysis through its e-freight program, research activities could build on this existing foundation.

- Preparation for reporting emissions. Carbon labels and the use of life cycle analysis appear to be the direction for quantifying climate change impact. IATA should support the development of standards for data collection and measurement, LCA processes, and interpretation. IATA should consult with ICAO as well as governmental and non-governmental bodies to develop standards consistent across the logistics industry and manufacturing supply chains.

- Inform the air freight community and communicate developments. With differences in perceptions of climate change impacts across regions, across products, a simple consensus on action will be hard to reach. Few airlines and forwarders are ready to engage climate change. A significant problem for air freight is that with several business models (belly, all cargo, integrated) some models are less able or willing to respond to climate change than others. A valuable service to the air freight industry for IATA would be reporting and informing constituents of recent developments, best practices, emerging standards, and facilitating discussion within the community. Communicating developments will also inform interested external parties and support an image of continuous action.
REFERENCES


