Climate Change Conflict in Sustainable Aviation

-A case study of Cathay Pacific Airline

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In two-year study periods, I have learnt the ideas of Sustainable Development and relevant engineering knowledge at KTH. This master thesis composed for me a possibility to link my work experience in Aviation Industry with the sustainable development issues.

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Abstract

By analyzing the sustainability performance and the framework of Cathy Pacific’s sustainable management, the paper tries to make contribution to the application and dissemination of practical approaches to sustainable management in Aviation Industry. This paper can be used as a base for decision and policy making to solve the global aviation environmental conflict at the same time as a consult in the option of technology and strategy, for international cooperation and as public information about the current circumstance and outlook perspective.

Key words: Aviation, Climate Change, Sustainable Development
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Chapter 1: Introduction

As international cooperation and global market play more prominent roles in the past 26 years, intercontinental passages by plane has greater than before almost three fold (IATA, 1981, 2006). Passenger travel by air predicted to continue to grow over the following 30 years (DFT, 2003) especially in Asia. With the ever-glowing aviation industry pushing the global economic growth, the concern from the government and public about the environmental performance of aviation are increasing too. Aircrafts are a significant source of greenhouse gases—compounds that trap the sun’s heat, with contributes to the greenhouse effect. Aviation Industry is projected to be among the most fast-growing greenhouse gas sources. The climate change becomes the biggest issue in reshaping and revising the aviation industry’s relationship, with governments. (Giovanni Bisignani, http://www.iata.org/pressroom/speeches/Pages/2009-06-08-01.aspx) Even in a global recession in 2009, environment remains as the top issue of the agenda in this industry. In addition, this led to a need for policy and practical reformation for the sustainable aviation, which involving economic, social as well as environmental impacts of aviation still in its childhood. The conflict in achieving a sustainable aviation is not easy to be resolved.

1.1 Sustainable aviation research from a historical perspective

Discussion on the topic sustainable aviation come forwarded with the IPCC Special Report published on the climate change impacts of aviation in 1999 (IPCC, 1999). The term ‘sustainable aviation’ first cited in reports work of Sledsens (Sledsens, 1998) which was published by the European Federation for Transport and Environment, and defined sustainable transport as ‘basic mobility to all citizens without damaging nature and the environment’ (Sledsens, 1998).

While the Air Transport Action Group (ATAG) make three criteria for sustainability in aviation such as targets and indicators for social criteria, aviation safety, environmental criteria, climate change and energy efficiency as well as economic criteria, (INFRAS, 2000, cited by Upham, 2003). Much of the research of sustainable aviation has focus on operations that are more efficient and energy saving technology. Many local and international efforts have been made. For example, the UK Government’s Omega research project, which provides almost 5 million pounds to develop technical strategies to lessen the environmental impacts of aviation; and to gather financial data, help the aviation industry prevaricate its business risks, as well as economic data, for allowing the government to internalize environmental externalities arise from aviation. (Omega, 2007)

However, there is a lack of research on how the social economic and environmental issues associated with this industry are being made in society and how the circulation, as well as production of a variety of environmental discourses, is reshaping policy for sustainable aviation especially. As Newton (2005) noticed, the environmental impacts of aviation dilemma are particularly obvious. Policy-makers are trying to put an end to the debate by way out to the language of balance, rationality and fairness in how the conflict in sustainable aviation can be resolved. This paper aims to develop this insight to explore the debates related with sustainable aviation, with an outlook to revealing how efficiently not only governmental but corporate strategies for sustainable aviation
are working and to inspire more knee-jerk strategies making to resolve the conflict as necessary. To achieve this goal, a discourse analysis should be applied. However, there is a lack of research on how the social economic and environmental issues associated with this industry are being made in society and how the circulation, as well as production of a variety of environmental discourses, is reshaping policy for sustainable aviation especially. As Newton (2005) noticed, the environmental impacts of aviation dilemma are particularly obvious. Policy-makers are trying to put an end to the debate by way out to the language of ‘balance’, rationality and fairness in how the conflict in sustainable aviation can be resolved. This paper aims to develop this insight to explore the debates related with sustainable aviation, with an outlook to revealing how efficiently not only governmental but corporate strategies for sustainable aviation are working and to inspire more knee-jerk strategies to resolve the conflict as necessary. To achieve this goal, a discourse analysis should be applied.

1.2 Aim, Objectives and Boundaries

Aim:
Develop a foundation for future policies and management for the aviation industry in order to handle CO2 emissions.
The thesis will use one company, Cathy Pacific’s, as a case study

Objectives:
Present and analyze the central challenges of sustainable development existing face the Aviation Industry today
Describe and make a critical analysis of Cathy Pacific Group’s existing sustainability policy
Make a critical analysis of Cathy Pacific’s Green Gas House Gas reduction solutions
Examine Cathy Pacific’s business strategy in relation to its sustainability management by analyzing how the sustainability management reflects the business activities.
Analyze the critical comments from different stakeholders concerning Cathy Pacific’s sustainability management.
Make reasonable suggestions to Cathy Pacific and other airlines to improve their sustainability policy and management from available information and previous research.

Boundaries:
As stakeholder worry about the climate change affects most in sustainable management of Aviation Industry, this report puts the majority of efforts on this issue.
Since current research has not agreed on how much the non-carbon dioxide emissions contribute to the climate change, this article did not go into this part.

1.3 Methodology

Having the ambition to create an investigative research to find a feasible solution for the climate change crisis in Global Aviation industry, rather than just a case study based deductive analysis; the thesis applied the following methodology as fundamental tools to achieve the aim.

1.3.1 Top down Approach

First of all, the top down approach is applied as a guiding methodology in this research. Top down approach is a strategy widely used in software development, but also can be
used as a thinking approach in many area from the organization and management to ecological analysis and so on.

According to the top down approach, the research conducts a comprehensive summary of the conflict in Climate change and Aviation Industry by global thinking at first. Then a case study of Cathy Pacific airline is made for additional analysis.

In the case study, the top down approach also be applied: Firstly, a general overview of Cathy Pacific’s Environment management system is made without going into details for any individual part of this system. Then, detailed study and analyze is made in parts of Cathy Pacific’s Environment management system which are closed to the research objective. In that way, the research boundaries are easy to identify while the research objectives are achieved step by step. Moreover, the top down approach enables the analysis having an international vision of the chosen topic avoiding negligence of any useful, logical connection.

### 1.3.2 DPSIR Framework

Another important methodology the research adopts is the DPSIR framework analyze. DPSIR is a crucial framework original adopted by EEA (the European Environment Agency) for illustrating the bonds mid the source and results of environmental problems as well as interactions between the environment and the society.

DPSIR is short for:
- Driving forces-economic or human activities which cause pressure
- Pressures -Representation for the driving forces
- State of environment- quantity and quality of nature resource
- Impacts-Effects or destruction of function the environment experienced.
- Responses-Diverse reparative actions attempted that may influence to any extent of inputs in this conceptual framework.

![DPSIR Framework](image)

*Figure 1 DPSIR FRAMEWORK Source: EEA, 2007*
This thesis introduce DPSIR framework as an Integrated Environmental Assessment approach to analyze how the emissions made by Aviation Industry related to the environment system and human system in a system view.

1.3.3 Descriptive method

The descriptive method has the function of describing the picture of the phenomena under investigation. This method involves collecting quantitative information regarding the contemporary status of sustainable aviation.

1.3.4 Other main methods

The paper is accomplished by literature study, documentation, questionnaire, extensive survey of Cathy Pacific’s operations; as well as sufficient communicate with different stakeholder in the sustainable aviation issue. These methods play vital roles in collecting useful information and pave the path for the research to take into the situation that is the objective of the report.
Chapter 2: Aviation Industry and climate change - A global conflict

2.1 The role of Aviation industry in economy and life

Obviously, aviation is an industry that plays an irreplaceable role in the modern world. Aviation helps us successfully achieve core of United Nations Millennium Goals from eliminating extreme poverty as well as hunger to promoting business growth that successively can nurture societal progress in other aspects.

![Figure 2 Civil Aviation’s direct contribution](source: Economic Contribution of Civil Aviation, ICAO)

The contribution of the entire civil aviation industry to the economic development locally and internationally is difficult to calculate because of its multiplier effects on other industries. Only in USA, more than $1.2 trillion are created by the aviation industry directly as well as creating 11 million jobs. (FAA air traffic organization, The Economic Impact of Civil Aviation on the U.S. Economy, October 2008) In a global view, it offered 31.9 million jobs according to the data last update in April 2008 provided by Oxford Economics.

In the 'global village' age, international flights undoubtedly serve as the lifeline of world economies. Aviation industry is not only the backbone of the tourism industry that is the most rapidly growing industry worldwide, but also the glue to global markets. Tens of millions of jobs are offered by this industry directly and indirectly by its air transportation supply chain involving airports, airlines, aerospace manufacturers, air navigation providers and so on. Depending on effective and safe flights service, human beings can enjoy the global cultural and entertainment experiences, much easier than their ancestors. Aviation moves people and products worldwide — quickly and safely. Aviation contributes to our life; enable us to visit different people, to travel, to experience new places, to identify the regions of the world.
2.2 General description of climate change conflict in sustainable aviation

Along with the global awareness with the environment performance, especially the climate change issue, more focus was put on aviation’s contribution to the green gas from public, government to NGO and so on. Sixty percent of total aviation emissions stem from international flights. Unluckily, Kyoto Protocol hadn't included it to let it lie outside guidelines of worldwide accepted emission reduction goals.

2.1.1 DPSIR analyze
It looks like that aviation plays not an important role in the climate change issue. Research of Integrated Panel on Climate Change showed aviation responsible for 3% to 3.5% of all carbon dioxide. In other words, 96.5% of greenhouse gas emissions produced by other human activities like road movement of vehicles, heating systems and many other industrialized activities

But is it true? Please read the following facts first

- 1 ton of burnt jet fuel emits 3.15 tones of CO₂.
- A Boeing 747-400 fully loaded with 216,389 liters (57,164 U.S. gallons) of fuel is carrying about 175,275 kg or 175.275 tones (386,411 lbs) at a fuel density of 0.810 g/mol (6.76 lbs/gal). The Airbus A380 holds about 310,000 liters (81,900 U.S. gallons) of fuel.
- a modern aircraft consumes approx. 0.035 liters of fuel per passenger/km.

Moreover, some scientist point that the aircrafts release their emissions at comparative high altitude where they cause more wars.

Not only has carbon dioxide affected the climate. But also other emissions in flight are radioactively functioning too in some degree. The extra emissions include water vapor, Oxides of nitrogen, soot and sulphate. However, we still don't know the true figure of Non-CO₂ aviation emissions contribute to the climate change.

2.1.2 Scenarios for global aviation emission to 2050

Many factors will affect the scenario of future global aviation emissions. These factors can be divided into two groups.

The first one we can call it pushing factors includes:

- Worldwide and local economic growth speed
- Population growth
- Travel demand involving business needs, recreation requires and so on.
The mitigating factors represent the factors can decrease the aviation emission contribution to climate change. Mitigating factors involving:

- Perfect air traffic management system
- Improvements in fuel efficiency
- Application of bio-fuel
- Aircraft infrastructure and engine developments
- Advancement in flight operation

Table 2.2 Future aviation emission scenario from 1990-2050

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1 Traffic measured in terms of revenue passenger-km.
2 All aviation (passenger, freight, and military).

2.1.3 Goals set
Aviation Industry made a response through International Aviation Transportation Association for the ever growing concern for its role in climate change. IATA following submissions of ICAO (International Civil Aviation Organization) made specific and ambitions goals as following:

• Target in the middle run:

  Improve fuel efficiency by 1.5% per year on average from 2009 to 2020

• Targets in the long run:

Cut half carbon dioxide emission volume from Aviation by 2050 compared to the emission amount in 2005.

2.4 Stakeholders in the conflict
There are several groups of stakeholder involving in the sustainable aviation issue:
- Aviation industry including airports, airlines, aircraft, device manufacturers and air navigation service providers.
- Employees: staff members who work for the aviation industry.
- Governments: including the dominant government and the other government. Obviously, international flights play a crucial role in this industry. Government local and international have strong power in shaping the business through legislation and policy setting.
- Local councils, which are affected by the aviation industry such as airport but who may also be employed.
- NGOs (Non-governmental organizations) who often take a unique interest in environmental performance.
- Regulators: who make the regulation for the regional aviation such as UK Civil Aviation Authority for regulating the aviation in UK
- Academy such as Research institutes, universities.

2.5 Public opinion for Climate change and Aviation development
People play a vital role in the conflict resolution of sustainable aviation. For the simple reason, that the climate change resolution in aviation requires difficult decisions that will impact on public’s behavior and live. Surveys on this issue are conducted in developing countries and developed countries. I choose China and Great Britain as samples.

2.5.1 Ever growing concern about the climate change
A. Survey conducted in China
Q1. Do you know about the climate change and the impact

Base: 749 adults in China + October 2008
Figure 4. Chinese public opinion on climate change

Source: Environmental Protection Ministry of China: global climate change survey of public
http://lvse.sohu.com/20080905/n259393372.shtml

Q2: Do you think everyone can change his/her life style to limit the climate change effects

Figure 5 what is the Chinese public want to do for climate change

Source: Environmental Protection Ministry of China: global climate change survey of public
Base: 749 adults in China + October 2008
http://lvse.sohu.com/20080905/n259393372.shtml

Compare the surveys conducted in GB and China, the interesting and meaningful findings are that the public in both China and GB wants the government to take the lead in tackling climate change and take the decisions necessary to change people’s behavior. They also have the same beliefs that efficient action by the government can have an impact.
• 95.9% of Chinese respondents say that the government should take the lead in combating climate change, even if it means applying the regulation to change people’s behavior. In GB, 70% share the same idea.
• 70% of Chinese respondents agree that China should take a responsibility as a largest developing country and could make a difference in universal climate change fighting. 66% of GB respondents agree that GB should responsible for the climate change and can help stopping this process.
• 88.91% of Chinese respondents willing to participate in environmental action to address climate change, and of which 45.79% of people have practical experience. Corresponding data in GB respondents are 71% and 53% respectively.
• 42.29 percent of respondents believe that climate change disaster will affect everyone, and sustainable development interests related to the common people, ordinary citizens should be concerned.

2.5.2 Aviation contribution to Climate Change

A. Survey conducted in China

Q3 which of the following transporting methods are affecting climate most?

![Bar Chart](http://www.noCO2.cn/VoteZ.asp/show.asp?id=33)

Table 2.4 the Chinese public ranks the traffic method in CO₂ emission
Source: Online survey [http://www.noCO2.cn/VoteZ.asp/show.asp?id=33](http://www.noCO2.cn/VoteZ.asp/show.asp?id=33) assessed in 18Jun
Base: 2057 adults in China + June 2010
The public generally sees aviation as second most polluting transport method

B. The public opinions in GB

Q3: Which kind of following transport do you assume would make most contribution to climate change for a travel between London and Edinburgh?
2.6 Root of the conflict

As the Chinese ancient philosopher Hanfeizi stated thousands years before, relations between men were determined by nothing but personal interests. It is the same story in the conflict in sustainable aviation.

What are the aviation industry needs? From the aviation industry’s perspective, make profits and cut costs are of course at the top of their agenda. To make biggest profits for survival seems true especially in 2008. In the first 6 months in 2008, the oil prices are increasing beyond the expectations. In the following period of 2008, global recession hurt the Aviation industry. Unexpected expensive energy and global recession lead to the loss in the International aviation industry. The aviation industry net loss for 2008 was -2.0% margins that amount to US$10.4 billion, and operating profit for 2008 was US$1.5 billion. However, the net profit in previous year (2007) was 2.5% margin that amount to US$12.9 billion and operating profit in 2007 was US$19.7 billion.

Shippers and travelers will always expect greater value at reduced prices. The government and NGOs are putting more and more pressure on the carbon dioxide emission by the aviation industry. However, when push the whole industry to achieve environmental friendly future, the government still wants the aviation industry operating in a safety and growing way to avoid the job loss and economic decrease.

2.7 The concept of balance in the sustainable aviation conflict

The concept of balance was introduced to the sustainable aviation conflict in order to making rapid growth in Aviation industry with the alleviation of environmental impacts locally and globally carbon emissions. (Newton, 2005) It is necessary to make clear of the notion of ‘Strong’ and ‘Weak’ sustainability firstly. The strong sustainability explained by Brekk as followings ‘Strong sustainability 'viewed like non -diminishing life opportunities (Daly 1992, p. 72). This would be achieved by conserving the accumulation of technological capability, natural resources, human resources and

---

Table 2.5 Public in GB rank the traffic method in CO₂ emission
Source: ONS Omnibus May 2005
Base: 1203 adults in Great Britain
The survey indicates that most of GB public assumes taking plane will contribute most in Climate for the specific journey.
environmental quality.’ (Brekke 1997 p. 91) The main idea of ‘weak sustainability’ is that the natural capital can be taken place by manmade resources of equal value. (Brekke 1997 p. 91) In the conflict of sustainable aviation, different stakeholder holds different version of sustainability. NGOs and local councils pursue the aviation industry to develop a balance fits into the strong sustainability. However, the aviation industry holds the notion of ‘weak sustainability’. Therefore, the conflict between the aviation industry, governments and the NGOs are somehow between the strong and weak versions of sustainability. Hence, the conception of sustainability should be exploited precisely to make a radical and practical resolution in the conflict of sustainable aviation. Effective communication should be made between different stakeholder in the conflict in order to search innovative way of framing, shaping and enclosing the dilemma. Therefore, the conflict between the aviation industry, governments and the NGOs are somehow between the strong and weak versions of sustainability. Hence, the conception of sustainability should be exploited precisely to make a radical and practical resolution in the conflict of sustainable aviation. Effective communication should be made between different stakeholder in the conflict in order to search innovative way of framing, shaping and enclosing the dilemma.

2.8 Aviation Industry’s Response to the climate change conflict

Responding to the green house concerns, IATA stands for the international Aviation Industry made four-pillar strategy reduce the Aviation’s contribution to CO₂ emission. (IATA, November 2009, Switzerland, A global approach to reducing aviation emissions) This strategy is generalized like following:

First and foremost, promote the technology, this looks like most promising but most expensive solution. Provided that sustainable bio fuels are found, we can easily cut CO₂ emissions by 80%, on active carbon life-cycle basis. We have to develop more efficient engines for better airflow and fuel combustion. For example, application of geared turbofan engine can decrease the fuel consumption by 10-15%. Moreover, the open rotor device can cut fuel consumption 25%. (IATA, 2009) We also have to update the aircraft to more efficient series. The flights should be made lighter, more productive and fuel efficient than the current fleet. However, as IATA estimates, more than $2 billion investments for updating the current fleets can reduce only 1% overall emissions reduction by 2020. (IATA, 2009)

The second pillar is operational changes. It involves analysis of the carbon foot print and makes effective environmental management. IATA also creates Green Teams to investigate and help airlines achieve the operational fuel efficiency as well as emissions reduction targets. This pillar involving cut the APU (auxiliary power unit) usage, make effective flight procedures, and reduce the weight can reduce 3% emissions by 2020. The third Pillar is called infrastructure. Implementation of more efficient ATM (Air Traffic Management) and airport infrastructure could provide an additional 4% emissions reduction by 2020. (IATA, 2009) In this pillar, Air Traffic control should be improved, and more efficient airport infrastructure should be made to reduce CO₂ emission. This pillar can help Aviation reduce fuel and emission in the near future. In fact, short the flights routes can reduce CO₂ emissions clearly. Cut one minute in flight time can save 62 liters of fuel as well as 160kg of CO₂ emissions. This pillar is proven applicable in the previous year. IATA shortened about 395 air routes in 2007. This lead to 3.8 million tones of CO₂ emission reduction.

The fourth pillar is economic methodology. According to the industry’s goal setting, to get a cap of CO₂ emission in 2020, 90 million tons of carbon dioxide emission has to be offset in 2025. The past three pillar strategies cannot meet this ambitions goal
obviously. Aviation Industry has to apply Market Based Measures to fulfill the gap. Market Based Measures; include carbon offsets projects, emissions trading program, Voluntary Activities, carbon funds or other similar mechanisms. However, these methods will be a substantial cost for aviation every year airlines need to input $7 billion in this field, to achieve the CO₂ reduction goal. Economic measures should meet the cost-effective and non-discriminatory criteria.
Chapter 3: Case Study of Cathay Pacific Airways

3.1 Overview of Cathay Pacific Airlines
Cathay Pacific Airways is known as the one of most highly rewarded airlines in Asia as well as Pacific areas. Headquarter of Cathay Pacific is located at Queensway, Hong Kong. It also acts as the flag carrier of Hong Kong. According to Skytrax which is the most credible consultancy company focus on the public expression of In-flight Analysis Services, it is one of five airlines which can be categorized as five stars. Skytrax also named Cathy Pacific as Airline of 2003 and 2005 based on passenger satisfaction survey. In 2006, Cathy Pacific was honored by Official Airline Guide as well as Air Transport World. (Cathay Pacific, http://www.oneworld.com/ow/member-airlines/cathay-pacific)
Cathay Pacific is an intercontinental airline provides organized passenger and freight services. Its service connects 117 destinations across 36 countries and territories. Other services they provide are such as airline serving, aircraft ramp handling plus ground manipulation services. Cathay Pacific's fleet consists of 123 wide-bodied aircraft. It is also famous for their various unique offers to the customers. Their business areas cover North Asia, South West Pacific, South East Asia and Middle East, Europe, North America, and South Africa. One point has to be stressed; it has the top well-developed network in Asia which is the most fast growing and profitable area in Aviation. In traditional aviation market-Europe and North America, Cathay Pacific shares the market actively through serving the gateway cities with connections with British Airways, French Airways, American Airlines and other code partners.
The Cathy Pacific’s routes can be generalized as following Picture:

Picture1:CathyPacific’s routes
Source: Cathay Pacific, 2009

3.2 identifications of the driving forces
It can be helpful to show the overall context, finally leading to the creation of Cathay Pacific’s Sustainable management framework. So this part presented the different
driving forces behind Cathay Pacific Airway’s Sustainable Management ultimately leading to the values of this airline in terms of Sustainable Development.

3.2.1 External driving forces

**ICAO and IATA**
One of the greatest challenges today is climate change. The airline industry recognized the increasing and compelling needs to address the unfavourable effects of climate change, particularly that weakening sustainable economy with social development as well as efforts to eliminate poverty.
Corresponding to the climate conflict, ICAO (International Civil Association Organization) and IATA (International Aviation Transportation Association) have established a comprehensive and forceful scheme to reduce the entire industry’s greenhouse gas (GHG) emissions. IATA also creates a new work team called 'Green Team' to assess and report operational fuel efficiency and emission reduction within airlines.
As a member of IATA and ICAO, Cathay Pacific has to follow the industry association’s sustainable management framework and objectives.

**Other external regulations**
External regulations from industry union and local authorities are, of course, a driving force for Cathy Pacific, which has to be in compliance with these standards. For instance, except signed the Poznan Communiqué on Climate Change for the UN Climate Change Conference. Cathy Pacific also has to follow the Hong Kong Clean Air Charter Certification Scheme, an emissions audit of operations and facilities have to be carried out.

**Stakeholder’s Pressure**
Sustainability strategies result in a greater favour from stakeholder and the general public. Indeed, a well developed sustainable management system shows that Cathy Pacific Airways values social and environmental concerns about the impact of its activities. Thus, it can be a way to increase their sales particularly in the case of the aviation Industry; this positive impact has a more widely impact than for other companies who delivers products and services to the industry customers. Indeed, the general public is more attentive to the environmental performance of a company than industrial customers.

**Media**
Media is another driving force for the company's Sustainable Management System initiatives. Related to the various climatic crises, as flooding, drought, growing concerns about the climate change effect, more articles can be read on environmental issues. As every coin has two sides, media coverage can be seen as a positive element, since it obviously helps the transmission of the concepts of Sustainable Development. On the other hand, media can also be extremely dangerous for a company. BP, with the scandal about the Oil Spill in Gulf of Mexico, is an example of the possible consequences of an influential media attention for the components of Sustainable Development. (Paddy Allen and Holly Bentley, 2010) Media can let the company’s reputation and profits drop extremely fast provided it made a ‘unsustainable mistake’.

3.2.2 Internal driving forces

Cathy Pacific Airway wants to gain an advantage over its different competitors on the market. Become more sustainable than they are can thus represent an asset for Cathy
Pacific. In the sake of profits, having a long-run strategy for the environmental management assures the company of a responsible business with profitable growth. In its 2009 Sustainable Development report, Cathay Pacific made adaption to the ever growing concern climate change from customers. In this latest report, it emphasised the need to engage with climate change issues and to active in mitigating its impacts and adapting to future. (Cathay Pacific, 2009)
Moreover, Cathay Pacific committed to leading the sustainable development both within Hong Kong and throughout the global aviation industry.

3.3 Overview of Cathay Pacific’s sustainable Management System
Cathy Pacific tries to integrate sustainable care into daily decision making process of all the business operation. So they develop the sustainable development strategy followed the integrated approach.

3.3.1 Management System
Refer to the definition of EPA (US Environmental Protection Agency Environmental Protection Agency), Management System is a framework enables the company to identify, manage, and then reduce its impacts while improving its operating performance in a continuous and systemic process.
This continuous cycle can be simplified as planning, implementing, reviewing and improving the procedures and practices. Thus the organization sets about to meet its business and environmental targets. The core of management systems is built on the "Plan, Do, Check, Act" model. This model enables the continual improvement based on the following steps. (Figure x illustrates the typical sustainable management system in an organization.)
I. Plan: Establish the objects and process needed to hand over results in accordance with the anticipated output.
II. Do: Carry out the new procedures.
III. Check: Check, monitor the new processes and compare the results against the expected results.
IV. Act: Review the progress and acts in previous steps to make necessary changes to the management system.

Figure 1: Working phases of the PDCA process
[Sandvik Material Technology (2), 2008]
3.3.2 Cathay Pacific’s Sustainable Management System

In Cathay Pacific’s sustainable management system, PDCA model can be illustrated as following :( Cathay Pacific, 2009)

V. PLAN:
Define what sustainability means to Cathay Pacific Group. Indentify sustainable aspects and set up the goals. From 2009, Cathay Pacific firstly introduces a new strategy to plan its sustainable management system. This strategy Engage with a wide group of stakeholders in the plan step. The main stakeholders include suppliers, customers, investors local and international environmental non-governmental organisations. The core of the new strategy is the Stakeholder Materiality Matrix. (See figure 2)
This matrix help the company define and rank the sustainable management aspects by engagement with different stakeholders.

![Stakeholder Materiality Matrix](image)

Source: Cathay Pacific, 2009

Figure 2. Stakeholder Materiality Matrix

VI. Do:
In this step, Cathay Pacific implements four categories operational controls:

- **Environment**
The most serious effects from Aviation Industry are the green gas emissions and other accompanying air pollutants from fossil fuel combustion. So Cathay Pacific puts the climate change key at the top of their agenda. They conduct operations from updating the aircraft fleet to minimizing ground taxi time. Other environmental influences are including the use of water and hazardous chemicals in their airship and engine maintenance works. Plus the waste generated from in flight services.

- **Flight safety**
This comprehends Safety, health and security concerns. They apply the quality and incident plan along with precautionary measures in this field.

- **Business**
Their business operation is involving organizing aircraft fleet, catering services, and handling ground services. Accompanying influence extends to consumer issues, supply chain management plus employee affairs.

- **Community Involvement**
They invest community in aviation, education, medical care and the environment.
These operations mostly are conducted in Hong Kong. Try to initiate the employees to work on meaningful dynamism; they support the partner community's long-term development.

VII. Check
Conduct programs and policies to ensure the sustainable management quality. C
Comply with relevant rules such as public policy, competition compliance, privacy, anti-corruption and so on.

VIII. Act
From 2009, Cathay Pacific began to apply FTSE4 Good Index Series to internally review and implement globally standards and benchmarks.
GRI’s G3 guidelines are the main reporting approach.

3.4 Climate change solution-top in the SMS
The most significant impacts from Aviation relate to the fossil fuels usage and the corresponding green house gas.
In Cathay Pacific’s Sustainable management framework, climate change impact solution is most important aspect.
IATA’s Four Pillar Strategy is been applied in the company’s sustainable management system to reduce CO\textsubscript{2} Emissions as below:

- Modernize the fleet
The efficiency of aircraft types is extremely influential in this environmentally sensitive era and when fuel prices are the largest cost for airlines. Refer to Green Team’s research, each kilogram of fuel burned matches to 3.16 kilos of CO\textsubscript{2} emitted. In other words, if an A320 can save 1% fuel can affect the entire aviation industry save 100 tons fuel waste each year, which means can deliver a cost about $146,000 per year for the whole industry. More productive results led by 1% fuel reduction including the emission reduction in 319 tons of CO\textsubscript{2}, 2.112 t. of Nox, 56 kg of CO, 98 kg of SO\textsubscript{2} and 124 tons of H\textsubscript{2}O (IATA GREEN TEAMS, 2008, http://www.iata.org/SiteCollectionDocuments/Documents/IATAGreenTeams2008.Ppt)

Obviously, fuel and CO\textsubscript{2}-efficient airplanes can help the operation of airlines environmentally and economically. Modernize the fleet by putting the fuel-efficiency freighters in use, especially in long-haul while phase out the old ones. Moreover, replace the fleet also can reduce aircraft maintenance costs, in addition to, the fuel consumption reduction.

To reduce operation footprint, in 2007, Cathay Pacific ordered 10 Boeing 747-8 Freighters plus seven additionally 777-300ERs intended for the future fleet modernization.
Compare the Cathay Pacific Fleet profile between 2007 and 2008, two 747-200F and three 340-300 are phase-out. Meanwhile, two Boeing 747 ER three Boeing 777-300 ER and three more Airbus 330-300 aircraft are introduced. Compare the Dragon air Fleet profile between 2007 and 2008, three 747-300 and 747-400BCF are phase out in 2008. Moreover, they have phased out all the 747-200 ‘Classic’ aircraft until 2009. The following profile shows the Cathy Pacific fleet situation until the 31 December 2009.
Fleet updating helps the company save the fuel usage while reduce CO₂ emission. For example, 777-300ER can reduce 22 percent fuel consumption per payload tone than 747-400. The longer range 777airplanes (777-300ER, 777-200LR and 777 Freighter) incorporate component and system modifications. The 777-300ER reduces fuel consumption - and CO₂ emissions - by more than 20 percent per seat compared to its closest competitor. These innovations maintain a long trend in commercial aviation. (Boeing, 2010)

In Airbus series, for example, the difference in fuel consumption between the A332 and the A333, reaches approximately 5%, for a distance of more than 4,800 (nm).

- Make improvements in fleet maintenance
This category of Methodology to reduce fuel consumption and cut green house gas emission include: Improvement in fleet layer, efficient air traffic routes, and active flight plan.

A revolutionary base layer exterior paint on an A340 aircraft can reduce 23 kg aircraft weight and reduce water consumption. Alternative engine wash systems have also been trialed to enable more efficient fuel flow improvement, leading to fuel savings and emission reductions. During aircraft trials, this fleet maintenance show excellent potential in reducing environmental footprints. However, Cathay Pacific needs assess their broad application further in the future operation.

Efficient air traffic routes also show the power to reduce the CO₂ emission effectively. A new route via the Russian Far East from Hong Kong to Europe has taken placed the standard MORIT route from Hong Kong to Europe. This traffic routes innovation can cause a reduction in flight mileage from 18 nautical miles to 12 nautical miles. In other words, this can reduce 0.6t to 0.9t CO₂ waste from Hong Kong to Europe by one flight. Innovative flight routes in 2008 help the company cut 78 ton CO₂ equal to the use of 24,956 kg of fuel in total.

- Sustainable energy
The aviation industry is developing towards sustainable bio-fuel time now. Sustainable energy can drive down the airline’s emissions simultaneously address the environmental impact of its operations.

Cathay Pacific has made long-term cooperation with all leading aviation fuel suppliers. The aim is to introduce new technologies, evaluate the viability and sustainability of the alternative fuel in research now. However, for an alternative fuel to be realistic it must be deployed safely, able to intermix with existing fuel, sufficient available and be sustainable produced. In 2009, Cathay Pacific joined the Sustainable Aviation Fuel
Users Group (SAFUG), a Boeing-led industry working class united by the desire to promote commercialization of sustainable aviation bio-fuels by developing robust, global sustainability criteria and best practices for the aviation bio-fuels market. (Travel Weekly, 2010)

To meet the sustainability criteria of SAFUG, Cathay Pacific committed that aviation bio-fuels must not compete with food and drinking water supplies, biodiversity, and local populations. Cathay Pacific has adopted some Alternative energy sources now. They use a solar panel to heat water for the dishwashers used by the food court. They also try innovative wind- turbine to supplement office tower lighting system. Cathay Pacific intends to develop wind power as a primary power source if the experiment is successful. (Cathay Pacific, Lufthansa, JAL and sustainable development, 2010)

- carbon offset program

Economic instruments

A carbon offset is a financial instrument aimed at a reduction in greenhouse gas emissions. Carbon offsets are measured in metric tons of carbon dioxide-equivalent and may represent six primary categories of greenhouse gases. (Intergovernmental Panel on Climate Change. 2001)

Carbon footprint of a passenger’s flight decides their offset payment. This payment will invest in emission-reducing projects. Some airlines charge mandatory offset payment; others make it totally voluntary; the middle options are making this an opt-out decision. Silver jet conducted a research and found if Aviation charge per passenger just $1.8 for each hour they fly by average, this industry can neutralize the carbon pollution created by it.

FLY greener

FLY greener launched since 2007 is the carbon offset program conducted by Cathy Pacific. This program firstly only aimed at offsets airline staff travel on airline business associate with carbon dioxide emissions.

From 2008, FLY greener encouraged the participation of the passengers and corporate customers. It can be conducted when the passages using the online booking system. FLY greener offers passengers the opportunity paying by cash or frequent flyer miles, to offset the carbon emissions associated with their own flight. Cathy Pacific Group also the first airline in Asia launched the carbon offset program directly managed by the airline itself. This carbon offset program has been promoted through the following ways: e-newsletters forwarded, advertisements posted, Cathy Pacific’s clients’ publicized and sales brochure given. For corporate offsetting, it produced a leaflet for all account managers, reservations staff and sales agents and developed a dedicated website for our corporate clients. It is also producing a brochure to encourage further uptake of the program. FLY greener not only promotes environmental awareness among passengers but also help the company’s CO2 reduction projects development.

Calculation methodology of Fly Greener is from ICAO (International Civil Aviation Organization) offset methodology. Cathy Pacific’s operational data are applied in the calculation instead of the aviation industry’s averages. This enhances accuracy in some extent. The quality of invested carbon offset projects determines the overall effectiveness of FLY greener. So it is necessary in choosing the right carbon offset projects. The criteria on choosing the appropriate projects are like below:

First and foremost, projects must meet Voluntary Carbon Standard (VCS) or VER plus. (Cathay Pacific, 2008)

Voluntary Carbon Standard is the designation for the project-level quantification, monitoring and reporting as well as validation and verification of greenhouse gas emission reductions or removals. (EP, 2010)
VER plus is a full-fledged carbon offset standard and closely follows the Kyoto Protocol’s project-based mechanisms (CDM and JI). (Carbon Offset Information Portal, 2010)

Secondly, the result of chosen carbon offset projects should lead to real reductions in carbon dioxide amount.

Last but not least, the chosen projects should benefit local communities.

So the priority is given to the projects located in countries where Cathay Pacific has substantial business operations. Moreover, the chosen project should make future contribution to the sustainable development over Asia.

Base on the above guidelines, FLY Greener invest in wind power generation projects in Chongming Island (Shanghai) and Nanhui District (Shanghai) in 2007. The installation of the wind farm facilities provides economic opportunities for the local community and helps developing renewable energy in China. Cathay Pacific also implement natural gas fuel switch project in Beijing, a natural ‘run of river’ hydro plant in Guizhou Province and a group of 20 wind turbines in Heilongjiang Province. These offset projects bring environmental and economic benefits to local communities.

In Fly Greener, Cathay Pacific Airways and its sister airline Dragon air have bought 20,000 tons of CO2 reductions from offset retailer JP Morgan Climate Care. The offsets will be resold no-profitably to passengers by FLY green. FLY Greener was conducted firstly in 2007.

Up to March 2009, 30,000 tones of CO2 totally have been offset by passengers. In 2008, travelling airline staff offset 11,814 tones of CO2 at a value of $116,000.

In order to increase passenger uptake, Cathay Pacific conducted different kinds of initiatives. Passengers can buy offsets through a variety of channels in the near future.
Chapter 4: Business strategy and sustainability relationship in Cathy Pacific

A “Green business advantage”

The sustainability policy and plans of Cathay Pacific are not a restriction in the long run but a fantastic business opportunity, according to the company itself. Indeed, far from being a cost to the company, sustainability is raising a giant chance for this company. Innovation is the key to sustainability, and it can lead to a competitive advantage and above-average profits. Cathay Pacific is thus committed to becoming a “green leader” in the Aviation industry. They work together with their partners in order to achieve a so-called "Green Business Advantage." Being aware of the environmental protection is not only the routine work for Cathay Pacific as the public would expect, but it will also determine the potential of it to beat their competitors.

B. A mirror for its own business?

Sustainable management reflects Cathay Pacific's business activities in many ways, such as the equilibrate balance between group profits, environment value and employee’s welfare. To achieve this win-win green business and fair balance between profit and environment protection, an early input is inevitable. For instance, in order to perform better in its "green" business, it sets Environmental Affairs Department ensures the implementation fits environmental commitments and works closely with other departments through the Sustainable Development Steering Committee, Climate Change Long Term Action Group, Dragon air Environmental Committee and the Swire Group Environmental Committee. This Department reports directly to the Management Committee level through our Director Corporate Affairs. In this way, Cathay Pacific has the possibility to achieve a sustainability and environmental friendly management.

C. Stakeholders’ criticism

As be stated before, climate change and fuel efficiency are the priorities in Cathay Pacific’s Sustainable initiatives and corresponding sustainable management system. However, not every stakeholder accepts this idea. Through the stakeholder engagement process, some stakeholder criticize that Cathay Pacific has placed too much more emphasis on environmental initiatives. By contrast, it did a comparably poor work on social and community activities. Different Stakeholders acknowledge Cathay Pacific’s initiatives differently, with some stakeholder having remarkably little knowledge. For Cathay Pacific itself, it is a sign for future communication improvement. Involving stakeholder participating in the sustainable management process will help them understand it better. Communication is also noteworthy approach Cathay Pacific must learn. Cathay Pacific should make transparent and effective communication on sustainable projects. In that way, stakeholder can accept Cathay Pacific's efforts and participate in voluntarily. A case in point is the FLY greener project.

From Table 3.2, we can get that there was a decline not only in carbon dioxide offset amount and investment cost in 2009. Some stakeholder think it is ridiculous refer to Cathay Pacific’s commitments to continuous efforts in CO₂ reduction projects.
Table 3.2 data on FLY greener from 2007 to 2009

<table>
<thead>
<tr>
<th>The year</th>
<th>carbon dioxide offset by passengers(tonnes)</th>
<th>carbon dioxide offset by Cathay Pacific and Dragonair staff business travel(tonnes)</th>
<th>cost of carbon offset program(HK$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>none data</td>
<td>11400</td>
<td>850,000</td>
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<tr>
<td>2008</td>
<td>3457</td>
<td>11814</td>
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</tr>
<tr>
<td>2009</td>
<td>3263</td>
<td>8097</td>
<td>550,000</td>
</tr>
</tbody>
</table>
Chapter 5: Discussion

5.1 Current status:
Despite Aviation taking a united position to plan for its commitment to environmental mitigation, Copenhagen failed to formalize an international aviation environmental policy. Until the end of the COP15 (15th Conference of parties), Aviation was not mentioned in the Copenhagen Accord. The core of the failure is that the governments did not get a formal decision.

IATA stresses that Aviation should account its emission at a global level, meanwhile; airlines only need pay for them once. Despite the industry had put its own ducks in a row, independent government looked at individual target but garnered little support. A reasonable solution is an international tax to help developing countries failed yet.

Lack of a specific mandates and formal global framework let aviation industry vulnerable. Aviation’s own proactive measures were partly responsible for the lack of leadership from the Copenhagen meetings; still, it is unfortunate that states did not comprehend the industry’s realistic goals.

In a policy vacuum, aviation must open eyes wide to what measures government may suggest filling the gap. The Copenhagen Accord was not the legal settlement of COP15 but rather a part agreement—leaves the door open to the possibility of a patchwork quilt of regulations and objects.

Practically, cutting emissions from aviation is still complicated:

i. Firstly, Aviation industry emits thousands upon thousands of emissions from the motion. Since this industry composed of fewer stationary emission sources, straight controls on aircraft or engines face obstacles. Not only monitoring the corresponding emissions for this sector is a tough job, but also emissions from this industry influence climate in a couple of ways. Controlling merely CO₂ discharges may miss other effects of aircraft on climate unconcerned.

ii. Secondly, impressive growth in Aviation making itself much more energy-efficient in modern times sets obstacles: improving load factors were comparatively easy when they were at 50%; at the current level, approximately 80%, one initiates to approaching the limits of further development.(ATA, 2008)

iii. Thirdly, a series of emission reduction methodology is out of the industry’s control, involving the pace of modernization of the air traffic control system, and aeronautical research and engine modifications fuel efficient improvement. In these occasions, government agencies play crucial roles.

iv. Finally, the sector faces controls from different countries. International negotiations for a post-Kyoto-Protocol emissions control scheme may give rise to emission limits in other countries, too.

In the war of Aviation fighting for climate change, there are still other obstacles, such as:

• Fuel prices will drive growth and adoption of improvements to fuel efficiency.
• Economic downswing and financial stress of airlines will limit investments in emissions decreasing investments and new generation of more energy efficient aircraft purchases.
• Take forecasted demand growth into consideration, pure decreases in emissions will be harder in spite of technological and other developments.

5.2 Possible improvements

MORE RESEARCH
More relevant research is needed to make out the exact effects of aviation on climate change, such as the effect of condensation trails on cirrus-cloud formation, plus the impact of such clouds on climate change.
Research to monitor the ultimate effects of trade-offs among different interventions in aircraft operations and discharges including:
• Develop NOx reduction technology while continue improving fuel efficiency in CO₂ emissions
• analyze flight effects on ozone and contrail formation
• change future geographical distributions of the fleet
• Different impacts the day/night operations will on climate change
• Include climate metrics in this solution-aimed research

5.3 Transparency
To solve the global climate change conflict in Aviation, funding will be one crucial approach. However, developing countries claim that to solve this conflict they need funding.
On the other hand, developed countries no longer have the money or desire to pay for this, and hence the formation of the Advisory Group to find sources for climate change funding.

5.4 Integrated system approach
ICAO has the responsibility to make a global integrated system approach. Aviation’s climate change solution is a complicated and multidisciplinary problem. Although there are several ways to distinguish problems in a system framework, a system approach works best as scientific and economic factors are set, and diverse environmental, managerial, moral and regulatory forces are embodied inside the analysis. Since that, the Aviation Industry needs a global integrated system approach to solve climate change conflict. Not only the relevant technology research but also market-based measures should apply the integrated system approach.
Chapter 6: Conclusion

The public desires action on Aviation's climate change effects, even when knowledge is unsure and, in spite of if this means making personal sacrifices.

The Government could thus interfere to ensure that the aviation industry makes a clear contribution fight for climate change. Carbon dioxide controls might affect global aviation industry in foresee future, be they set controls on appliance emissions, release tops applied to the sector as full, fuel refiners, or carbon tax. Depending on their tightness, the impacts of most of these methodologies could ruffle by the economy, given additional incentives for aircraft manufacturers to improve the fuel efficiency of aircraft, increasing the cost of air travel and air freight, and provided additional force to develop the air traffic control system.

To solve the climate change conflict in Aviation Industry, the governments and the industry association should apply global system integrated approach in a transparent and fair environment.
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