The “future traveller”
A model based approach to determine passenger demand at
Amsterdam Airport Schiphol

Arjan de Witt
November, 2011

Part I Main Report
Project Details

Master thesis project: The “future traveller” 
A model based approach to determine passenger demand at Amsterdam Airport Schiphol

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Keywords

Strategic management/ Air Traffic/ Schiphol Airport/ Scenario Analysis/ Quantitative model/ Forecasts
Preface

Although sometimes the last eight months were hard, I really enjoyed the time I spend on this project. From the start I was really sucked into this project, the combination of aviation, strategic decision making and modelling were a perfect match for me. In the project I was able to combine my interest in aviation, with specific knowledge from my study. I am glad to see that I could apply a large number of the methods I learned during my study. The combination of a modeling approach, together with qualitative insights and a scenario analysis really fits with the TPM background. At the same time I had to obtain a lot of specific knowledge about the aviation sector.

The project’s strategic level was one of the main difficulties of the project, whereas I did not have much prior experience doing so in my study. The industry’s complexity makes it very hard to do more precise forecasts. The dependencies in the industry between actors, the dependency on supply variables and the on-going changes in the industry impede the creation of forecasts. Also during the interviews I sometimes experienced the resistance because of business political reasons.

I want to conclude with thanking the people without whom this report would be finalized. First of all I would like to thank my direct supervisors, Wouter, Jan Anne, Jan and Bert. Secondly I would like to thank the Schiphol Group for giving me the opportunity to do my graduation thesis and all employees that provided me with data and or information, a special thanks to Hylke from this perspective. At last I would like to thank the interviewees for their time and their effort. They provided me with a lot of knowledge and indepth discussions.
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**Executive summary**

The Schiphol Group is planning for a 2025 Master plan for its airport Schiphol. This Master plan will incorporate strategic decisions about new designs to improve terminal quality, which is very important in the competition between European hub airports. Underlying those strategic decisions is a better understanding of the future travellers and their needs. Schiphol will have to choose which segments to satisfy. The question that this research addresses is; “Who are the future travellers Schiphol should focus upon in their 2025 Master plan?” This thesis concludes that it is very likely that the share of elderly travellers will increase in the next 15 years. The share of Chinese passengers will also increase considerably, however the uncertainty here is larger.

This research examines the differences between current and future passengers by determining trends and uncertainties and quantifying them.

Three possible emerging trends for the future passenger at Schiphol are defined; the rise of the Chinese and Indian market and the ageing trend. These trends are determined by formal interviews with seven experts and are confirmed by literature review and data analysis at Schiphol. Uncertainty within these trends is taken into account by means of scenario analysis; this is preferred above a false sense of certainty. Five scenarios are created and tested in the, for this research specifically developed forecasting methods.

The 0-scenario uses current forecasts for independent variables and does not take specific uncertainty into account. The ageing trend in the developed world directly impacts the number of elderly travellers. A doubling of the percentage of 60+ travellers between now and 2022 to approximately 20% is forecasted, rising and stabilizing at 30% in 2034 in this scenario. This growth is dependent on the increase of the percentage 65+ in Europe and the United States, the Gross Domestic Product in Western Europe, the share of low cost airlines at Schiphol and the Oil price. Given the current projections, the number of aged 60+ travellers at Schiphol will become a major share of the total number of travellers.

While the Chinese market at Schiphol expanded rapidly in the recent years, the potential of the market in terms of economic growth and population size is still enormous. The volume of travellers between China and Schiphol will know an exponential growth in the coming years. The forecast model predicts an at least threefold increase in the current volume up to 2025. On the longer term a continuing of the exponential growth is predicted. This growth is dependent on the population growth, the oil price together with the ticket price and the increase of the gross domestic product of Western Europe and China.

The Indian market at Schiphol experienced a small decline at Schiphol in terms of passenger volumes in recent years. Though, experts emphasize its potential growth derived by the population size and projected economic growth. The forecast model indicated that the growth of the Indian market will lag behind the expected Chinese growth. Schiphol’s market share in Western Europe on the India flow is relatively small. Meanwhile the Indian air traffic market is less developed and more regulated than the Chinese one. On the longer term India is forecasted to grow exponentially. The exponential growth of the Indian market is delayed upon the Chinese market.

The second scenario is the “de-hubbing” scenario. De-hubbing is known as “partial or complete abandonment of a hub by the dominant carrier”. The dependency on the Air France-KLM group, the ongoing consolidation, the rise of Middle Eastern carriers and the proposed ETS system increases Schiphol’s vulnerability to de-hubbing. At the same time world urbanization continues and smaller long haul planes are developed, increasing the attractiveness of point to point connections.

In this scenario de-hubbing at Schiphol is combined with a European economic downturn. The forecast model is based on the assumption of the KLM as a hub airline with an extensive international network and cannot analyze the effect of de-hubbing. The effect for the number of connections to the Chinese and Indian market will be disastrous. The ageing trend will continue, both
positively and negatively influenced by de-hubbing, however as the total volume might decrease the amount of elderly might as well.

In the third scenario “the elimination of feeders”, further low cost development will occur. Easyjet and the KLM will cooperate, where KLM focuses on the long haul, Easyjet takes over some of the feeder flights. Schiphol will become European market leader in the combination of low cost and network carriers. As price advantages will occur it may be assumed that KLM will increase their market share internationally, also in the upcoming markets. The increase in the number of low cost airlines will lower the expected growth of the percentage of elderly travellers.

In the fourth scenario, “booming business”, a good performing European economy is combined with a high economic growth in the upcoming economies of Asia and an increased oil price. The demand will increase by the larger effect of an increase in GDP than a higher oil price. The percentage of elderly travellers stays stable.

In the fifth scenario, “sustainable Europe”, Europe introduces an extensive European trading scheme. Although the higher prices will have a major impact on the flows to India and China, these are still expected to increase. As the elderly traveller is less price sensitive, the percentage of elderly could slightly increase. If the impact on price will increase the share of elderly travellers is considered to decrease as well.

In Table 1 and Table 2 an overview has been given of the findings of the scenario analysis. Market shares and total number of passengers are calculated based upon the forecast from Schiphol’s own forecast model up to 2030, the growth until 2040 is extrapolated.

<table>
<thead>
<tr>
<th></th>
<th>0-Scenario</th>
<th>Elimination</th>
<th>De-hubbing</th>
<th>Booming</th>
<th>Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly</td>
<td>16</td>
<td>15.5</td>
<td>Decline</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Elderly %</td>
<td>22%</td>
<td>21%</td>
<td>Constant</td>
<td>21%</td>
<td>23%</td>
</tr>
<tr>
<td>China</td>
<td>3.5</td>
<td>3.6</td>
<td>Decline</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>China %</td>
<td>4.8%</td>
<td>4.8%</td>
<td>Decline</td>
<td>4.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>India</td>
<td>1.7</td>
<td>1.8</td>
<td>Decline</td>
<td>1.9</td>
<td>1.2</td>
</tr>
<tr>
<td>India %</td>
<td>2.4%</td>
<td>2.5%</td>
<td>Decline</td>
<td>2.6%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

**Table 1 Overview of the scenario analysis for 2025 (amount of passengers in millions)**

<table>
<thead>
<tr>
<th></th>
<th>0-Scenario</th>
<th>Elimination</th>
<th>De-hubbing</th>
<th>Booming</th>
<th>Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly</td>
<td>35</td>
<td>35.2</td>
<td>Decline</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Elderly %</td>
<td>30%</td>
<td>29%</td>
<td>Constant</td>
<td>29%</td>
<td>31%</td>
</tr>
<tr>
<td>China</td>
<td>7.7</td>
<td>7.9</td>
<td>Decline</td>
<td>7.7</td>
<td>5.7</td>
</tr>
<tr>
<td>China %</td>
<td>6.7%</td>
<td>6.5%</td>
<td>Decline</td>
<td>6.7%</td>
<td>5.1%</td>
</tr>
<tr>
<td>India</td>
<td>4.9</td>
<td>5.2</td>
<td>Decline</td>
<td>6.2</td>
<td>3.4</td>
</tr>
<tr>
<td>India %</td>
<td>4.3%</td>
<td>4.3%</td>
<td>Decline</td>
<td>5.4%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

**Table 2 Overview of the scenario analysis for 2040 (amount of passengers in millions)**
Three conclusions can be formulated after the scenario analysis. First, the effect of ageing on air traffic at Schiphol is large and relatively certain in all scenarios. Those elderly travellers do have different needs and requirements for terminal quality, even compared to current elderly travellers. They are in better health, digitized and able to spend more money.

Second, the number of travellers between Europe and China is expected to increase heavily in the coming years, though the degree of uncertainty is higher. In three of five scenarios the number of Chinese passengers increases heavily. As the Chinese traveller distinguishes itself from the other travellers, they also require specific services focused on their specific language and culture.

Third, the rise of the Indian market seems to be less robust. Although the Indian market has an enormous potential, the biggest growth in this market is expected after 2020 and the role of Schiphol is very uncertain.

Based on this research a number of recommendations are composed. First, the elderly require specific services to be designed and incorporated into the Master plan 2025. More research to their specific needs is necessary. Secondly, for the Chinese customers a balance between risk and investments should be defined by the decision makers. A better insight in their needs and requirements should be obtained.

Fourth, Schiphol should actively research the feasibility of low cost and network carriers’ cooperation as it will benefit the competitive position. Practical problems regarding the cooperation, for example baggage transfer and labeling, should be researched and if possible solved.

A fifth recommendation is to monitor the independent variables for de-hubbing and de-hubbing as a whole at Schiphol. Meanwhile Schiphol should research re-hubbing possibilities and make the airport less vulnerable for de-hubbing.

Sixth, the effect of a European emission trading scheme should be minimized. Schiphol could anticipate on this scheme by responding to environmental awareness. For Schiphol a worldwide trading scheme should be preferred above a European one. Next the situation regarding the Emission trading scheme should be monitored closely.

The final recommendations are about future forecasts. The impact of emerging economies tends to be unpredictable as forecasts differ a lot over time. With more data available a more reliable forecast can be determined; therefore a yearly update of the research of emerging markets is required. The effect of ageing is more reliable and does not need the same frequency of research.

Schiphol should introduce the Indian market as a separate market in its yearly forecasting model. Meanwhile, also other emerging countries and regions, like South America and Indonesia, could be researched and closely monitored to detect new and potential developments. A last recommendation is to use the Western European traffic flow information more often to incorporate overlapping trends and make the data less sensitive for strategic decisions by carriers.
Chapter 1. Introduction

Schiphol airport, the fifth largest airport in Europe based on passengers and air traffic movements serves yearly around 45 Million passengers (Schiphol Group 2011). The hubmodel is crucial for the number of connections at Schiphol airport as the catchment area for Origin & Destination passengers is rather small compared to the extensive network offered (Schiphol Group 2007). Schiphol’s importance for the Netherlands is large, lying in the Randstad it connects Dutch most density populated and business area with the rest of the world. One of Schiphol’s objectives is to serve the Netherlands by offering a certain degree of network connectivity.

1.1 Problem statement

The competition within and outside Europe between hub airports is high. Improvements to the airport quality and the quality of services offered at Schiphol are necessary for continuity of the mainport and fulfilling its task of “Serving the Netherlands”. The Schiphol Group is developing the airport’s strategic Master plan for the year 2025. In this Master plan Schiphol will have to make choices about how to improve terminal quality. These new services should fit with the customer needs and requirements of future travellers. To derive these needs a better understanding of the future traveller is required. At the moment there is just limited information available about this future traveller; a quantitative approach is required.

The following problem statements are derived:

“There are limited insights in the factors influencing the passengers needs and requirements in the upcoming 15 years and beyond at Schiphol airport”

“There is no quantitative approach for integrating socio economic characteristics of passengers, for the upcoming 15 years and beyond at Schiphol airport”

1.2 Problem analysis

Schiphol’s current position, as one of the leading European airports in the last decades, can be attributed to strong negotiation skills about bilateral air traffic agreements, the strong international carrier KLM and the airports’ successful policy. The competition between European hub airports intensified since the entry of the European open market. Bilateral agreements are more and more negotiated by the European Union and due to the consolidation in the airline industry mergers, acquisitions and alliance forming take place, resulting in a change of the European aviation landscape (Burghouwt 2007). The rise of Middle Eastern hub carriers along with their hub airports have become another major threat in recent years for Schiphol (Button 2008). As Schiphol slowly loses a lot of their advantages upon competitors it is essential to sustain their leading position within Western Europe. While the competition in the aviation industry is getting heavier the aviation industry is changing. Emerging markets, new business models, shifts in the mature markets and on-going consolidation are just a limited set of factors influencing the industry. Schiphol has always been leading in the field of airport management and was able to attract a sufficient amount of passengers to operate a large hub and spoke network by its home carrier KLM. The heavy competition it faces together with the upcoming changes in the industry urged Schiphol to improve their business.

For many of the European hub airports the quality of the product offered is an important selection criterion for passenger. In the intercontinental network the quality of service and the operational efficiency are key criteria to become a major hub airport (Oum and Zhang 2001). The effect of airport quality should not be underestimated as Schiphol has proven to attract customers from Great Britain by a lack of quality at Heathrow airport in London for the last decades.
As competition on price and quantity are not feasible, Schiphol’s objective is to be European’s preferred airport, delivering high quality services to passengers and airlines (Rutten 2009). Schiphol’s position among other European airports, in respect to the airport’s quality, has been stabilizing lately while competitors are improving. Other competitive hub airports, especially Madrid and London are enhancing their quality significantly (Van Velzen and Ruysenaars 2011). This research will focus on the improvement of the terminal quality.

![Figure 1 Motives for travelling by Schiphol in the year 2000 (passenger profiles)](image)

For the continuity of business at Schiphol it is of major importance to stay the competition ahead by adopting high quality developments in the terminal to make the airport more attractive for airlines and passengers. These developments should be integrated in the airport’s Master plan, which includes the developments up to 2025.

For developing high quality services for passengers and airlines, for over 15 years, a better understanding in the future passenger needs and requirements is necessary. Socio economics influences play an important role in the conversion towards the future traveller. The word population will change drastically in the coming next years (National intelligence council 2008).

Nowadays Schiphol is already planning ahead for the longer term. At the moment the strategic master plan for 2025 is prepared. In airport strategic planning a medium to long term development plan of an airport is composed (Kwakkel 2010). Airport strategic planning varies from tactical and operational planning by its time period, as it can take from 5 up to 30 years of time, operational planning is on daily basis and tactical planning is up to 5 years in beforehand (IATA 2004). One of the reasons for strategic planning is that developing airports is very time consuming. The multi actor context, the big uncertainties and the many external factors making it difficult to do ad hoc decisions (Burghouwt 2007; Kwakkel 2010).
Chapter 2. Research structure

In chapter 1 the following problem statements were derived:

“There are limited insights in the factors influencing the passengers needs and requirements in the upcoming 15 years and beyond at Schiphol airport”

“There is no quantitative approach for integrating socio economic characteristics of passengers, for the upcoming 15 years and beyond at Schiphol airport”

In this chapter is described how this research project finds answers and solutions for these problem statements.

2.1 Introduction

The question asked in the introduction was; “Who will be the passenger of the future?” The relevance of this question is discussed in detail; considering that people’s opinion about the quality of an airport is determined by the fulfilment of their needs, identifying the passenger needs is of great importance.

At the same time it can be expected that the needs of current passengers are known sufficient. In the future no sudden changes are expected in these needs, independent of the changes that will go with ongoing innovation. Simultaneously a share of the future travellers will be different than the current ones, influenced by worldwide developments in socio economic characteristics of travellers. These “future customers” for Schiphol airport do have other needs and preferences with respect to airports and airports services.

This study performs the first step in the development of new services for the future traveller. It identifies the trends and uncertainties and it will give an answer on the question, “who will be the future traveller?” It will also estimate the impact of these future travellers by estimating a forecast model to determine the bandwidths of this development. Where this research focuses on identifying the future traveller, subsequent research should identify needs of these passengers followed by the development of new services.

As it will be too complex and nearly impossible to integrate all developments in socio economic characteristics of passengers, three trends will be picked to study in detail. These trends were selected on their impact, by interviewing experts and considering an extensive literature review.

2.2 Thesis Objectives

This study consists of four main objectives;

The first objective is: “To determine the relevant and specific changes in socio economic characteristics of passengers for the Master plan’s timeframe and beyond at Schiphol airport”.

The second objective is: “To identify uncertainties, related to the first objective, in air traffic development at Schiphol airport”.

The third objective is: “To develop a quantitative forecasting method to determine the impact of socio economic”.

The fourth objective is: “To examine and analyse the forecasting method under uncertainty, making use of scenarios, for the Master plan’s timeframe and beyond at Schiphol airport”

In this statement “determine” means giving bandwidths to possible future developments.
A change is “relevant” when the potential impact is large. The “impact” consists of the amount of potential passengers involved and the size of the change. There will be a “specific change” if it is expected that particular passengers will put other user requirements to an airport. The forecasting method should have a time span until 2025 (Master plan) and beyond.

2.3 Research questions

“Who are the future travellers to which Schiphol airport should improve their quality to be ahead of the competitors up to 2025 and beyond?”

<table>
<thead>
<tr>
<th>Research Questions</th>
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<tbody>
<tr>
<td><strong>Objective 1:</strong> “To determine the relevant and specific changes in socio economic characteristics of passengers and the uncertainties within for the Master plan’s timeframe and beyond at Schiphol airport”</td>
</tr>
<tr>
<td>What is the current and future outlook of aviation?</td>
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<td>What is the current and future outlook of Schiphol?</td>
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<tr>
<td>Which socio economic characteristics of passengers are expected to change?</td>
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<td>Which trends affect the air transport demand at Schiphol?</td>
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<tr>
<td>Which trends do emerge on a worldwide scale affecting air transport?</td>
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<tr>
<td><strong>Objective 2:</strong> “To identify uncertainties, related to the first objective, in air traffic development at Schiphol airport”</td>
</tr>
<tr>
<td>What are the main uncertainties in air traffic in general?</td>
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<tr>
<td>What are the main uncertainties at Schiphol specific?</td>
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<tr>
<td>How can these uncertainties be integrated into different scenarios?</td>
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<tr>
<td><strong>Objective 3:</strong> “To develop a quantitative forecasting method to determine these changes by integrating social demographic data under influence of uncertainty”.</td>
</tr>
<tr>
<td>What kinds of travel demand models are available?</td>
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<tr>
<td>What are the user requirements for the forecasting model?</td>
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<tr>
<td>Which demand model will fit the discussed problem?</td>
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<tr>
<td>What does a travel demand model for Schiphol will look like?</td>
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<td>Which determinants influence the demand and supply of air traffic at Schiphol airport?</td>
</tr>
<tr>
<td>What is the influence of these determinants on the demand and supply of air traffic at Schiphol airport?</td>
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<tr>
<td>What changes in the input parameters are expected over time?</td>
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<td><strong>Objective 4:</strong> “To examine and analyse the forecasting method under uncertainty, making use of scenarios, for the Master plan’s timeframe and beyond at Schiphol airport”</td>
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<tr>
<td>How can we examine the behaviour of the forecasting method under different scenarios?</td>
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<td>How can we implement the different scenarios in the forecasting method?</td>
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<td>Which input parameters will be influenced under the different scenarios?</td>
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<td>What will be the influence on these parameters in the different scenarios?</td>
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2.4 Problem scope

The research is conducted at the Schiphol group and will focus on the passengers market at Schiphol airport. The larger part of the research can be applied on the bigger hub airports in Europe and even on a more global scale to see the result of socio demographic changes that can be expected in the future on aviation. Schiphol has a specific challenge, compared with other major European hub airports, being the second hub in the Air France-KLM network with a limited hinterland.

A qualitative research will give guidance to the trends, uncertainties and developments. Three trends will be chosen for further examination, making use of a forecast model. These trends are considered to have a major impact.
To answer the question about who will be the future traveller, this research focuses on the shifts in travellers. It will identify changes in the industry as well socio economic changes in the world that influence the distribution of travellers over time.

Long term planning in the aviation industry is quite uncertain. There are many external forces that can have a major impact on the industry such as the oil price, credit crunch or terrorism. Although this research is quantitative, it will indicate bandwidths instead of point estimations, as it is impossible to say anything about the exact numbers. This study will be on a strategic level and will be guidance for future developments. This research will use quantitative data to do some qualitative conclusions. Scenario analysis will be used for dealing with uncertainty and determining the bandwidths for the future.

2.5. Current research at Schiphol airport

Most research in this field of study is at Schiphol airport performed in two departments at Schiphol; Aviation statistics and forecasts (ASF) & Marketing research and analysis (MRI) (Appendix 4 Organisational Chart Schiphol Group). The department ASF makes traffic forecasts for Schiphol airport.

Data from the past have proven that the mode can explain around 93% of the traffic (Ter Beek 2011). The flows between 21 different worldwide markets that are defined and Schiphol are examined. These 21 different worldwide markets consist of countries with a large flow or countries grouped together by their specific characteristics. For each market a difference is made between O&D traffic and transfer traffic. Logarithmic Regression analysis will determine the flows of passengers. There are no variables at the supply side integrated in this model (Ter Beek 2011).

The department for Market Research and Intelligence is focussing on passenger research. Some of their activities contain:
- The yearly monitor examination of 100.000. travellers
- Benchmarks with other airports
- Passenger profiles
- Quality insights
(Van Velzen 2011; Wolfers 2011)

2.6 Shortcomings current analyses

Most of the analyses provided by the MRI department are lacking of quantitative data and cannot be used for future exploration. Next to this their analysis for the future are often less thoroughly. The future research conducted by ASF is lacking the ability of forecasting emerging trends. These analyses are very suitable for identifying and solving capacity problems, but they do not focus on the socio demographic changes that will impact the airport services. They also do not take uncertainties into account.

The ASF department forecasts the flow to China. However these forecasts are less adequate as the analysis is based on a too small number of years. Emerging trends are hard to measure with the existing method. The flow to India is integrated in one of the markets but is not measured independently. The impact of ageing trend is not measured at all.

Strategic scenarios for airport development are used very limited. These scenarios only comprise economic growth and the oil price. The scenarios established for this study are more useful for strategic decision making and finding robust solutions. These scenarios are integrating (European) air traffic specific trends with the opportunities and vulnerabilities of Schiphol airport in particular.
2.7 Scientific relevance

The aviation field of study is very comprehensive. Many research institutions all over the world are focusing on research in this field and many scientific papers have been published. The number of papers about travel demand models for single airports, multi airports regions and the market as a whole is extensively in literature (Abed, Ba-Fail et al. 2001; Adler and Berechman 2001; Brons, Pels et al. 2002; Dennis 2002; Button 2008). The combination between socio economical characteristics development and their impact on aviation in the future is studied rarely. The major players in the industry (Boeing, Airbus, IATA, ICAO etc) do have their estimates about market development between Western Europe and China and Western Europe and India. The ageing trend has not been studied before.

The description of emerging trends and uncertainties within the aviation industry is also unique for this research. Of course these trends and uncertainties are rapidly changing, but an overview of all these trends and uncertainties is rarely found in literature. Most of the studies focus on one subject. Although scenario planning is an often used method in literature (HHI Leipzig Graduate School of Management 2010; Owen, Lee et al. 2010; Franke and John 2011), most of the scenarios do not take specific aviation trends into account, focusing only on the macro-economic trends like economic growth and the rise of the oil price. For a general demand model this is often enough, however an airport specific demand model requires more uncertainties related to this airport.

2.8 Research approach

This research distinguishes three important phases. In the qualitative phase key trends and uncertainties are identified based on literature review, interviews and data analysis. This results in a conceptual model along with a number of scenarios.

![Figure 2 Research approach](image)

In the second phase, the quantitative analysis, regression analysis and gravity modelling will be used to determine the impact of the separate factors. The scenarios developed in the qualitative analysis
will be used in a scenario analysis, combining the model outcomes with different input data based on the scenarios. During the synthesis the outcome of the scenario analysis is the input of recommendations and conclusions.

2.9 Research methods

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Table 3 Research methods

2.9.1 Literature review

Literature review is used for gathering data. An extensive list of all sources can be found at the end of the report. Important search terms that are used in the research are:

- Air transport/Aviation/Air traffic/Air travel
- Demand/Trends/Developments/Uncertainties/Market/Business
- Transport demand
- Determinants/Factors/Drivers/Elasticity’s
- Forecast/Model (Regression, econometric, discrete choice, ACCM, gravity, system dynamics, time series)/Scenario analysis
- Schiphol/The Netherlands/Europe
- Asia/China/India
- Ageing/Globalization/Urbanization/Migration/Environment/De-hubbing
- Business traffic/Leisure traffic/Transfer/Origen Destination
- IATA/ICAO/Boeing
- Airline/Air France-KLM/Low cost/Low budget
- 2020/2025/2040/2050

All terms are combined in many ways. The research is executed within scientific databases like Web of Science, Jstor and the Wiley databases and with help of search engines like Google scholar and Scopus. This study also includes non-scientific sources like consultancy reports and governmental studies; those are found by search engines on the internet. Important websites used for the research are the Airmeth’s website, the Airports Council’s website and the websites of institutions like the OECD, UNWTO, European Union and Dutch government. It also comprises intern data and information of the Schiphol Group.

2.9.2 Interviewing

Two types of interviews are held during this research; formal and informal interviews. The informal interviews were performed within Schiphol for a better understanding of the organisation and the current methods Schiphol uses, these interviews provide background information and will not be discussed anymore. The seven formal interviews are held with experts in and outside the air traffic. In this semi structured interviews, three main topics were discussed:

- Trends and development within the aviation industry
- Uncertainty related to these trends and development
The position of Schiphol airport

Interviewees were asked for their opinion, the appendices give an overview of the main findings during these interviews. A set of questions was imposed in forehand as a backup.

The interview candidates were selected based upon different criteria:

- There should be a link with the air traffic industry
- The interviewees should be aware of the Netherlands and the position of Schiphol in the Netherlands
- They should be experts in their field of knowledge
- The interviewees should have a different background
- Interviewees should have knowledge of future developments in air traffic

The participants can be divided into roughly four categories:

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<thead>
<tr>
<th>Public Bodies</th>
<th>Research institutes</th>
<th>Tourism</th>
<th>Business</th>
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<tbody>
<tr>
<td>Jaap de Wit</td>
<td>Hans Heerkens</td>
<td>Kees van der Most</td>
<td>Pieter Cornelisse</td>
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<td>Jan Veldhuis</td>
<td>Paul Peeters</td>
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<td>Anke Pronk</td>
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<td>Frank van der Zwan</td>
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Table 4 Overview of all interviewees

The majority of these participants were contacted during the Airnext symposium in The Hague, the 14th of April. Other participants were invited by email. All of them were selected as first choice and none of the invited people cancelled the invitation. After the interviews the detailed interviews were submitted for approval of the participants.

An important advantage of interviews is that an in-depth analysis is possible; every interviewee can focus on its specialism and specific knowledge. This directly implies that the content of the interviews is diverse and cannot be compared easily. At the same time does it lack objective data.

The list with interviewees, together with the interview question and the detailed interviews are in the appendices.

2.9.3 Data analysis

A wide variety of data resources supports this project. The quantitative regression model consists mainly of data from CBS, Eurostat, Global Insights, Worldbank, United Nations, the APG database and data provided by the Schiphol group. Global insights is a world wide database that provides forecast and historical data for often used socio economic indicators, both on a country, regional and global level. The APG database provides flight information based on the sales of representative ticketing agents.

The data used to support reasoning is derived from a large number of resources but the majority is provided by the Schiphol group, in particular the Aviation, statistics and forecast department and the Marketing, Research and Intelligence department.

2.9.4 Modelling

To support the objective of a quantification of the trends and uncertainties a regression model and a gravity model will be estimated. The creation of the model is discussed exactly in part 2 of the report. This part focuses on the conclusions of these models.

2.9.5 Scenario analysis

Scenario analysis is an often used method for identifying the uncertainties in strategic decision making the uncertainties more visible for decision makers. Underlying for the scenario analysis are
the uncertainties defined in the interview and derived by literature review. In total five scenarios are composed.

2.10 Deliverables
The deliverables of this study are:

- An overview of the challenges and uncertainties of the aviation market
- A qualitative overview of future trends and developments in socio economic characteristics of travelers based on literature and interviews
- An analysis of the performance of these trends at Schiphol supported by data from Schiphol
- An overview of the major uncertainties in general aviation
- An overview of the uncertainties for Schiphol
- An overview of different models used in future exploration in transport
- An overview of different models used in future exploration in air traffic
- An overview of the generic supply and demand factors for aviation
- A regression model together with a gravity model to forecast the effects of the upcoming Chinese and Indian market on air travel
- A regression model to forecast the effect of ageing on air travel
- A set of scenarios, which include the major uncertainties, to base strategic decision making on
- A forecast method to determine bandwidths for the three trends based on the regression model and the scenarios
- A paper about the future challenges and uncertainties for European secondary hub airports
Chapter 3. Context
This chapter describes the context of this project. Successively the problem owner and its aspirations will be introduced, followed by some essentials in their business. The end of this chapter will describe the dependencies of the problem owner up to other actors. The objective of this chapter is to give a better understanding of Schiphol as an airport and their role within the Netherlands.

3.1 Schiphol Group
Problem owner in this project is The Schiphol Group. The Schiphol Group owns and operates Schiphol airport, Eindhoven Airport, Lelystad Airport and Rotterdam-The Hague Airport and also has participations in other airports around the world. The primary task of the Schiphol group is running the airport Schiphol (Schiphol Group 2011).

The Schiphol group is a commercial organization with public bodies as shareholders:
- Dutch government 69.77%
- Municipality of Amsterdam 20.03%
- Municipality of Rotterdam 2.20%
- Aeroports de Paris 8.0%
(Schiphol Group 2011)

For this research, focussing on future exploration and airport strategic planning at Schiphol airport, a number of departments are involved:
- Analysis Development and Innovation (ADI); A sub department of capacity management, responsible for the aviation operational capacity research on medium-long term (2-10 years) and for the development of new concepts.
- Marketing research and intelligence (MRI); Facilitates research to customer perceptions, which can be used for improvements in the business.
- Aviation statistics and forecasts (ASF); Provides aviation forecast to the business for the medium term of five until six years and describes trends for long term.
- Passenger services (PS); facilitating a smooth and friendly passenger process.
- Airport development (AD); Responsible for strategic innovations and decision making for the longer term.
- Hublink; Cooperation between Aeroports de Paris and the Schiphol group.

In Appendix 4 Organisational Chart Schiphol Group, the organisational chart of the Schiphol Group is displayed (Schiphol Group 2011).

SIM
This research is performed commissioned by the SIM (Samenwerking innovatieve mainport) program. SIM is the cooperation between knowledge institutions and business in the aviation sector; KLM, Schiphol Group, University of Technology Delft, NLR and TNO. Its objective is to combine knowledge and experience about aviation and to use this to improve the position of Schiphol as an innovative mainport. SIM distinguishes four categories of innovation, seamless travelling, the accessibility of the mainport, environment and surroundings and process optimization(SIM 2011). At Schiphol Group the SIM program is under supervision of the ADI department.

3.2 Schiphol airport
Schiphol was the first in 1998 by creating the so called “airport city”, which entails a traffic node of roads, railways and airways and a large amount of services available 24 hours a day (Schiphol Group 2010). The airport’s goal is to become Europe’s preferred airport, which means a top two position in terms of transfer traffic and a top three position in terms of origin and destination traffic. With a third place on the transfer segment and a seventh on the O&D segment there is a lot of potential
improvement (Van Velzen and Ruysenaars 2011). The importance of price and quality is stressed in the presentation “Europe’s preferred airport”, which argues that, due to limitations to the growth and high labour and external imposed costs, it is not feasible to compete on the grounds of price or quantity with other airports separately (Rutten 2009).

The positioning of Schiphol, next to Amsterdam and in the middle of The Netherlands most populated area, the so called Randstad, puts restrictions to the growth of the airport. For a long time inhabitants of the surrounding areas and environmental groups have protested against the expansion of Schiphol and the growth of the air traffic. The Alders Table have researched this problem and adopted some regulations for Schiphol to grow. The growth of the air traffic in the Netherlands is limited to 580,000 air traffic movements (ATM) in the year 2020, 70,000 of them should be performed from local airports. Schiphol airport can handle 510,000 ATM’s a year in 2020 (Luchtverkeersleiding Nederland and Schiphol Group 2008).

In Figure 3 the number of passengers of Schiphol airport’s direct competitive airports is graphed in the year 2007, before the credit crunch. The distribution of passengers along the airports in 2011 is expected similar to the distribution in 2007, except from Dubai. The growth at the Dubai hub airport in recent years has been very large. Mainly depended on the expansion of the Emirates airline network, the last years a growth percentage of around 13% a year has been reached. In 2010 47.2 Million passengers travelled by the hub airport (Dubai Airports 2011).

![Bar chart showing the number of passengers in Millions for competitive airports in 2007](image)

**Figure 3 Number of passengers in Millions for competitive airports in 2007 (Kolkman and Korteweg 2009)**

Schiphol’s main goal, addressed by their shareholder (The Dutch government) is to serve the Netherlands. Serving the Netherlands is done by providing an extensive network with airline connections over the world. Especially the connections to key markets, former colonies and upcoming economies are essential for the economic growth of the Schiphol region and the Netherlands as a whole. The large hub makes the Schiphol region attractive for many international companies. There are many employees directly employed as well as a large number of businesses that do exist. Laying in the heavy populated “Randstad” it is the airport’s task to minimize the congestion and the hindrance.

The role of Schiphol within the catchment area is important for the market position. When the attractiveness of Schiphol increases, compared to competitors, more travellers from the catchment area will use Schiphol.

There are two kinds of catchment area’s the landside area and the airside area. The landside area consists of all travellers using the airport as starting point or terminus of their air journey. Business travellers, O&D passengers or visiting relations or friends in the neighbourhood of the airport belong
to this group. The airside catchment area consists of transfer passengers (Conrath 2009). The landside catchment area can be enlarged by a good accessibility of the airport, for example by connecting the airport to the high speed rail network (Burghouwt and Huys 2003). For the landside catchment area of Schiphol a circle with a radius of 200 kilometres is frequently used. All airports within this distance are catchment area competitors (Schiphol Group 2007). At the airside the competition is even bigger. Depending on the market, there is competition between Europe’s hub airports sometimes complemented with hub airports in the Middle East, but also on some routes there can also be competition from Asian airports and airports in North America (Schiphol Group 2007).

The extensive network of destinations at Schiphol directly attributes to the Dutch economy (De Wit and Burghouwt 2009). The network quality of airports with a limited hinterland is very dependent on the hub carrier operating from the airport as argued by Gordijn in the report “De toekomst van Schiphol”. Zurich’s airport can be taken as example whereas after the bankruptcy of Swiss international airlines, many of the intercontinental connections disappeared (Gordijn, Harbers et al. 2007). The KLM has been the Dutch home carrier since 1919 and Schiphol airport’s largest customer. The KLM group also includes Transavia, KLM City hopper and Martin Air. In 2004 a merger between the two airlines resulted in the Air France- KLM group (KLM 2010). To sustain the network quality on Schiphol the Dutch government made some arrangements during the merger which included the availability of direct routes to a number of city pairs from Schiphol and the evenly development of both hubs. Although the due time of these arrangements was 2010, these arrangements are extended indefinitely (Eurlings 2010).

3.3 Other actors involved

Although The Schiphol Group is the direct problem owner for this study, many other actors do have their interest. Airlines and alliances are influenced by the strategic decisions taken at Schiphol airport. The role of the Air France-KLM group within Schiphol is obvious, as main user of airport facilities. There is a big difference between their demands and those of other full service carriers, low cost airlines as Easyjet and leisure carriers. Strategic decision making at Schiphol will influence the position of competitive airports in different markets and vice versa.

At the same time, there are many companies, directly affiliated to the operations at Schiphol airport that is affected by Schiphol’s policy. Another large amount of businesses are indirectly influenced by Schiphol airport. The international connectivity and accessibility of the Netherlands, for example, increase the attractiveness for multinational businesses. Tourist associations pursue the attraction of a large number of tourists to the Netherlands. While Schiphol’s broad intercontinental network will attract a large number of tourists from other continents, the availability of low cost services at Schiphol airport is essential for the development of European tourism (Van der Most 2011).

Meanwhile, those heavily affected are the travellers. A number of distinctions can be made between travellers; business vs. non-business, transfer vs. origin& destination, on country level, age groups, motivation and inspiration or on airline.

The national government has a double role. On the one hand it protects Schiphol’s surrounding areas and their inhabitants by minimizing congestion. While, on the other hand, its objective is to stimulate the economy and increase the attractiveness of the Netherlands for business and tourists. Together the national governments and local governments do have a direct interest, in minimizing the congestion for their inhabitants. Same time, the local governments often benefit from the airport by attracting business related to the airport, housing employees or attracting tourists.

From the in total 386.316 flight movements in 2010 on Schiphol airport, were 190.012 performed by the KLM. Together with Transavia, Martinair and Air France they have more than half of all total flight movements (Figure 4). Because of the large market share the dependency of AAS on AF-KLM is high. This dependency is mutual, as is not easy for the AF-KLM to relocate slot capacity somewhere else.
Figure 4 Distribution of flight movements for each airline at AAS in 2010 (Market Development Aviation Statistics & Forecasts 2011)

Air France-KLM is a member of the Sky team alliance, one of the three worldwide air traffic alliances. Sky team is in market share world’s second biggest alliance. Member airlines of an alliance closely cooperate by code sharing, using each other facilities and flying to each other hub airports (KLM 2010). By alliance forming and joint venturing Schiphol has become an important hub for the North Atlantic Joint Venture and for Skyteam. Schiphol’s business is influenced by the performance of both co operations of the KLM.
Chapter 4. Challenges and opportunities in the air transport sector

This chapter addresses two questions:

- What are the trends and uncertainties within the air traffic industry?
- What is the role of Schiphol within these trends and uncertainties?

First the outlook of the sector with recent trends will be briefly described, followed by an extensive description of the trends. At last the different uncertainties for the future developments will be discussed.

4.1 Introduction into aviation

The airline industry is a very complex, ever changing and competitive environment. Many external factors are influencing the demand and the capacity of air travel. Traditionally many countries have their own airline. Since the creation of the single European market in aviation and the entrance of low cost airlines the competition has been intensified (Doganis 2010). The impact of aviation in the world is large. Within The United States and Europe the airline industry is accountable for 1% of GDP (Button 2008). Direct, indirect and induced aviation business in Europe are accountable for 2,6% of total European GDP, with a potential towards 4,1% in 2020 (European Commission 2010). At the European airport operators 156.000 people direct staff is working on daily basis. On site there are another 1.200.000 people working and for every 1000 airport jobs another 2100 indirect jobs exist. Amsterdam Airport Schiphol accounts for nearly 2% of GDP of the Netherlands. This figure is expected to rise up to 2.8% in 2015 (Airports Council International 2010).

Aviation structure

Until the 1980’s, the aviation market was characterized by bilateral agreements between countries about capacity and price control. In 1978 president Carter of the United Stated announced the attempt for further liberalization of the market. In Europe, the first deregulation act was adopted by the European Council in 1987, which acknowledged the applicability of the treaty of Rome to air transport (Doganis 2010). The liberalisation of the European market was accomplished by other acts in 1990, 1993 and 1997. The liberalized market conditions have led to many incremental and non-incremental changes in the market. Airlines responded to these regulatory changes by implementing hub and spoke networks, strategic alliances and low cost concepts (Burghouwt and Huys 2003). The liberalisation towards an open world market will continue. An increased number of open skies arrangements is negotiated between different countries leading toward less government control over fares and capacity (OECD 2010).

The traditional point to point connections, used by a large number of airlines, were slowly replaced by a hub and spoke network. In a hub and spoke network, direct flights between smaller and medium airports are replaced by flights via a hub, to reach economies of scale and network economies. Passengers from different destinations can be bundled in the larger flights for long distance and intercontinental traffic. The hub is the central airport in the network where passengers can change planes. Most hub airlines implemented a wave system at their hub to minimize the waiting times at airports. Feeders from all over Europe collect passengers for the long haul flights (Dennis 1994; Frenken, Van Terwisga et al. 2003; Burghouwt 2007; Doganis 2010).

Consolidation

Most airlines do have strategic alliances with other airlines or are merged since the deregulation. There are simple strategic alliances like code sharing, in which an airline can use seats for their passengers at another ones plane, and the more complex alliances like the North Atlantic joint venture of Air France-KLM and Delta (Janic 1997). In the North Atlantic alliance both airlines have the same prices and share all the income earned on this route (KLM 2010). Worldwide there are three major alliances in which airlines are organized; Sky team (Delta, Air France-KLM), One World (British
Airways, American Airlines) and Star Alliance (Lufthansa, United). The mergers of KLM and Air France, Swiss and Lufthansa and Delta and North West are all consequences of the deregulation.

The appearance of low cost airlines can also be contributed to deregulation. The amount of air traffic in Europe performed by low cost airlines is increased significantly in the recent year and while in ’02/ ’03 most of the established carriers had to downsize there capacity the low cost airlines did not (Franke and John 2011). The aim of low cost or no frill airlines is to provide a simple product against minimum costs. By a high aircraft utilisation, limited service and the use of internet the costs per seat can be minimized (Doganis 2010).

The growth of aviation in the past century has led to many problems regarding the environment. Air pollution, noise, visual pollution and the use of fossil fuels are just some of the environmental problems. Because the density in Europe is getting higher and the amount of air traffic is steadily growing, regulations are necessary. The emission trading scheme, new technology and the use of bio fuels should reduce the problems. Nowadays, the environmental capacity already reduces the potential growth of air traffic at many airports (Airports Council International 2010; European Commission 2010)

4.2 Who will be the future traveler?

This chapter defines the emerging trends in the aviation sector. These views are largely based upon the interviews performed, supplemented by literature review (Appendix 3 Formal Interviews).

This paragraph concludes by naming three trends that will impact aviation in the future:

- The Chinese passenger; the number of Chinese passengers at Schiphol increased severely in recent years and the market potential of the Chinese market is enormous. Chinese passengers differ from other passengers in many aspects, like language and culture.
- The Indian passenger; although the number of Indian passengers at Schiphol stabilized in recent years the market potential of the Indian market is enormous as well.
- Ageing; the ageing society of the developed countries is impacting many industries including air traffic. The ageing society puts new requirements to airports.

The conclusions from above will be explained step by step in this chapter. Data analysis of the current situation will substantiate the conclusions.

4.2.1 General trend

Current forecast expect the airline industry to grow in the coming years. This growth, depending on the market (geographically) and the type of service (Button 2008), is expected to reach 5% a year on the long term reach 5% a year in passenger traffic, as many studies indicate (Boeing 2010; Leahy 2010). Nowadays 4% of the world population does fly regularly, this percentage is expected to increase (Peeters 2011). Although all markets will experience growth, the major growth will be derived in upcoming markets, in particular by the BRIC’s (Brazil, Russia, India and China) (Veldhuis 2011) (Figure 5). As many other industry the aviation industry will also reach maturity; in the US market and some other industrialized market already a trend of maturity can be recognized, resulting in a flattening of the growth on the long term (Vedantham and Oppenheimer 1998).
The growth of international air traffic in emerging economies, does effect the distribution of passengers on European hub airports, because it is a new group of passengers. Citizens from these countries will travel more internationally than they are used to be in earlier days.

**Emerging markets**

Although traditionally the North American and European market had the lead in air traffic growth, the major growth in air transport in the coming decades will be derived from the emerging markets (Boeing 2010). In Europe the transition markets of the former Soviet Union will know an accelerated growth of air transport. The largest increase will be derived from the emerging economies China and India (OECD 2010). Already in 2017 Asia will be the largest market in terms of demand and prospects (Airports Council International 2010). Asia, nowadays accountable for 21% of the travel spending, will in 2020 be accountable for one third of all. At the same time 22% of all global arrivals is from Asia (Oxford Economics and Amadeus 2010).

For the coming 20 years the potential of Africa is low, as the income levels are low. The South American countries can have an accelerated growth, though the uncertainty, particularly the political instability, is high (Ken Button School of George Mason University USA and OECD 2008). According to Jaap de Wit, the KLM thinks that their network of routes is almost optimal. Major changes in the next years will be obtained by opening new routes to emerging economies (De Wit 2011). For Schiphol this means that the change in passengers is to a large extent affected by these emerging regions.

The growth of air traffic in the last decades is derived by the expanding middle class in the West. The world's middle class is not homogeneous, if it is affordable to travel they will, stimulated by their intrinsic motivation to see more of the outside world (European Commission 2010). The middle class in the Asia pacific region is expected to growth significantly.

**BRIC countries**

The term BRIC-countries (Brazil, Russia, India and China) was introduced by Goldman Sachs in 2001 to give a name to the major growth regions for the 21st century. From 2000 until 2008 the BRIC countries contributed to 30% of world growth in dollars, compared to 16% a decade earlier and this percentage is keeps on rising (O’Neill and Stupnytska 2009). Estimations by Goldman Sachs state that the BRIC countries together will represent 35% of the total global aviation market in 2020. Likely they will also be the main driver of the aviation industry for the coming 10 years.

The Air France-KLM group’s focus is on South America as they expect the markets to expand further in this continent, this is depended on the possibility to have partner airlines in this continent for the feeder to the hubs (Cornelisse and Pronk 2011). Although the re-opening of the Rio Janeiro route by
the KLM in November this year and the resuming of the Buenos Aires flight at the end of October, Schiphol is still connected with a small amount of destinations in South America (Air France 2011; KLM 2011; KLM 2011). Aeromexico already joined the Skyteam alliance and Aerolineas Argentinas is planning to do so in 2012. At the moment code share agreements between AF-KLM and Gol Linhas Aereas do exist, while TAM airlines is a member of the competing Star Alliance (Air France 2011). Discussions are going on about the potential membership of Gol (Cantle 2011).

The large potential of the Brazilian market, the code shares with Gol and the re-introduction of the Rio de Janeiro route are reasons to believe that the number of Brazilian passengers will raise in the upcoming years. However as Paris has a traditionally strong market share on the South American destinations there are also reasons to believe most of the growth will be accommodated on Paris. In Figure 6 it is clearly visible that Schiphol is doing worse than their competitors with respect to the number of frequencies to Brazil.

Figure 6 Number of destinations in BRIC countries in September 2011 (Luchtvaartnieuws 2011)

China and India will represent the biggest growth in the airline industry for the coming years. Both countries combine their growth prospects with their enormous population (Kim, Poponak et al. 2010). Most promising markets for Schiphol airport seem to be the Chinese and Indian market. In recent years the Chinese market has been growing impressively, based by the number of passengers from or to this country (Figure 7). The Indian market, second biggest at Schiphol airport, met a decline in the last few years and turned into the third biggest market (Figure 7).

Figure 7 Number of Passengers from or to BRIC countries for the last 5 years at Schiphol

This report will continue with a description of the Chinese and the Indian market for air traffic. According to the interviews held for this project and the extensive literature review, these two
markets are widely recognized as market with the highest potential (Arthur D Little 2008; Ken Button School of George Mason University USA and OECD 2008; National intelligence council 2008; Van der Zwan 2011; Veldhuis 2011).

4.2.2 Chinese market

In the report “What happens when 1bn Chinese fly?” by Goldman Sachs, the growth potential of the Chinese market is indicated. Estimations in the report show that China will have the largest airline market globally, in 2020. From 2022 it will have one billion air travellers compared to the 284 million passengers it had in 2010. According to the same research China will not only develop as a creator of demand for international tourism it will certainly also attract many people from all over the world for leisure or business (Kim, Poponak et al. 2010).

The growth in Chinese aviation is closely related with the upcoming middle class in China, whereas the propensity to fly tends to accelerate when the GDP per capita becomes higher than 30,000. US Dollars (Kim, Poponak et al. 2010).

In the last two decades, from 1980 until 2008, Chinese international air traffic rose on average 14.3% per year, making it the fourth originating market globally. In 2008 the propensity to fly international was just 0.01, implying just 1% is an international traveller. Expectations estimate an annual growth of 21% a year, up to propensity to fly internationally of 0.1 (10%) over the next 10 years. Most of the international trips are performed in Asia nowadays but other; further destinations are expected to increase. Within Europe Germany and the UK have a high demand of Chinese passengers (Kim, Poponak et al. 2010).

![Figure 8 Propensity to fly in 2009, displaying the BRIC countries and an estimation for China in 2022 (Kim, Poponak et al. 2010)](image)

China is often referred to as fastest expanding outbound tourism market. Since 2002, when they overtook the leading position of Japan, China is Asia’s biggest market for outbound tourism (Uren 2009)
Figure 9 Chinese outbound tourism market 2005 (Uren 2009)

In the report “Report on Transport Scenarios with a 20 and 40 year Horizon” it is forecasted that the coming 20 years between 300 million and 600 million Asian tourist will visit Europe. Very attractive are cities like Paris and London but also other cities like Berlin, Barcelona and Rome are tourist magnets (Petersen, Sessa et al. 2009).

Although the majority of the studies are forecasting a major expansion of the number of Chinese travellers, some of the studies are tempering the enthusiasm. The report “Is the impact of China and India on future Long-Haul travel exaggerated?” argues that the GDP level of China is too limited to expect an incredible increase in numbers in the next decade. The GDP per capita therefore should exceed 15,000. USD (Love, Goth et al. 2006). Other industry experts underline the growth of China but do not expect it to become the biggest European outbound market for the next decades (Cornelisse and Pronk 2011). But in comparison to the USA, Europe’s biggest outbound market nowadays, Chinese and Indian travellers have to fly one-fourth of the number of flights by the USA citizens to become Europe’s biggest market (Veldhuis 2011). Other critics emphasize their uncertainties about China. They express their worries about the rising inflation, the export led growth and the excessive government spending (Bouman 2010).

The number of passengers on the China-Netherlands flow exploded the last decennium (Figure 10). A significant Chinese-Netherlands flow from Schiphol was founded in 1997. Due to the low amount of passengers in the beginning the figure is somewhat distorted.

Figure 10 A comparison between the growth of the number of passengers travelling to or from China directly and the total number of passengers in total at Schiphol (Market Development Aviation Statistics & Forecasts 2011; Martens, Van Diemen et al. 2011)
The demand for leisure travel from China will accelerate over the coming years. China will be the 8th country in number of people visiting the Netherlands in 2020. In 2020 between 400,000 and 500,000. Chinese will visit the Netherlands (Van der Most 2011).

### 4.2.3 Indian Market

India is the least developed BRIC-country in respect to the air traffic sector; the propensity to fly is relatively small (Kim, Poponak et al. 2010) and the market is still heavily regulated (Cornelisse and Pronk 2011). Future prospects are in India’s favour; besides China there is no other country worldwide that combines impressive economic growth with a population over 1 billion inhabitants. Currently more than 1.1 billion Indies are living in India, being world’s number two country in population size. This amount is forecasted to reach 1.4 billion by the year 2025 and 1.8 billion by the year 2050 making it world’s most populated country. After 2050 the growth will continue and is estimated to reach 2.2 billion in 2100 (Population foundation of India and Population reference bureau 2007).

As the Chinese industry is accelerating and the GDP levels are rising, India is still behind China in its development. As the growth of the middle class and the air travel demand are strongly related some studies argue that the development of the Indian outbound market will be limited in the next decades (Love, Goth et al. 2006).

On the longer term the market potential of India is huge. The Indian market opened up in 1991, almost 15 years later than the Chinese market (1978). As a consequence, many of the industries are less developed than the Chinese ones, including the aviation industry. In 2030 the global GDP of India is projected to reach 30 Trillion US Dollars compared to 1.7 right now (Lyons, Chakraborty et al. 2011).

In the latest IATA report the growth in international traffic was equal to the growth in domestic traffic, both 14% in Revenue passenger kilometres (IATA 2011). The percentage of Indian taking a plane is still limited. Only 2% of all Indians are flying domestically, while at most 0.5% is flying internationally. Although India and China are almost equal in population size the number of air trips is five times higher in China. A logical explanation forms The GDP per capita, which is almost one third of China’s (Centre for Asia-Pacific aviation 2010).

The same critics for the Chinese market will go along for the Indian market. While the GDP levels in India are even smaller than China’s it will not, in the next decades, reach a GDP of 15,000. dollar per capita to stimulate long haul travel as in Western economies (Love, Goth et al. 2006). The Indian economy seems to be more stable than the Chinese, as the economy is driven by domestic demand (Bouman 2010).

The Indian market on Schiphol is very limited. The Indian airlines are traditionally well represented in the United Kingdom with a large number of destinations and frequencies offered a week. While the frequency of flights a week from European airports to India increased in recent years, the frequency of flights from Schiphol decreased (Burghouwt 2010).

From Schiphol two destinations in India are served; Mumbai and Delhi (Schiphol Group 2011). Another destinations, Hyderabad, was cancelled due to local market circumstances and financial feasibility of the route (KLM 2008).

Compared to others, the Indian market is still heavily regulated. At the same time the competition between Europe and India is strong. Middle Eastern airlines, like Emirates, do have many routes into the Indian market (Cornelisse and Pronk 2011). According to the presence of Air France-KLM in the Indian market is very limited. This can be interpreted as an opportunity for Schiphol as the Indian market is not well developed at one of the hubs.

### 4.2.4 Ageing

The previous paragraphs were focused on the emerging markets. This paragraph will take a whole other socio economic trend in consideration. The ageing trend is an on-going trend that has been influencing worldwide air travel for a while and is expected to rise in the near future. Especially in the
developed world, whereas Western Europe, the United States and Japan do have a high percentage of elderly people in their population (Van der Most 2011). Ageing can be described as the increase of the proportion of the population in the older ages (Department of Economic and Social Affairs 2009). In general, underlying factors are the decline of fertility rates and a longer life expectancy, which are caused by an improved global health (World Health Organization 2011).

An increase of 4.4 years to 44 years is expected over the coming 20 years in the developed world. In the same period the average of the developing world’s population will increase by 5.5 years to 32 (Roland Berger Strategy Consultants 2011; Roland Berger Strategy Consultants 2011). Although the increase in the developing world is bigger, the problems that arise, because of the number of elderly of 60+, are heavier in the developed world. Elderly tend to require more expenses for healthcare and pensions, while they do not pay tax anymore. Figure 11 pictures the distribution of the 50+ population in the different continents. With almost 50% of the population being 50 or elder, Europe faces the biggest problems with ageing.

![Figure 11 Age development in the world percentage of 50+ in population (Nederlands Bureau voor Toerisme en Congressen 2008)](image)

The report “A sustainable future for transport” underlines the impact of ageing in Europe, whereas in 2060 the European population will have, on average, a seven years higher age; with an expected percentage of 30% of people elder than 65 years old. Aged people of today are travelling more than their parents did and this trend will continue in the future (Directorate-general for energy and transport 2009).

Ageing in the Netherlands and the impact on the air travel demand is substantial. People’s welfare, the lack of time during their working life and the existence of the baby boom generation (After world war II) contribute to the increase in air travel demand by elderly people (European Commission 2010; Peeters 2011).

Elder travellers differ on many aspects form the other travellers; needs and requirements, destination choice, travel purpose and access modes are unique for these travellers (Burghouw, Wit et al. 2006). Elderly also tend to travel more. In the category of travellers doing at least three trips the share of 50+ travellers is already 43%. Also Heerkens thinks that ageing will have impact on the air traffic sector in the future. Some considerations are;

- Number of Seats at the Gate is often very limited
- Travel information should be easy to find and to use
- Older people can be afraid for the chaos at the bigger airports (Heerkens 2011)

The ageing society puts new demands for airports like healthcare and accessibility. However it can also generate a lot more turn over as elderly people tend to spend more on airports and will pay
extra for luxury services. The average expenditure of a 65 years old traveller is three times higher than the youngster traveller (Arthur D Little 2008).

Ageing at Schiphol is mainly influenced by the ageing of the (Western) European population, in particular the Dutch population, and the ageing of the North American travellers.

![Figure 12 Distribution of passengers divided into age groups over time (Martens, Van Diemen et al. 2011).](image)

In Figure 12 the ageing trend at Schiphol can be identified. While the percentage of passengers between 21 and 40 is declining, the number of passengers above 50 is increasing. In 2010 the percentage of 50+ at Schiphol airport was approximately 27% and the percentage 60+ approximately 10%.

### 4.2.5 Miscellaneous

The business class segment for airlines is an important segment as it generates a large percentage of the revenues. The total capacity of business class seats is 15% of the total while the revenues sum up to 28% of the total (Mason and Alamdari 2007). Opinions about trends in business travel are diverse. As stated in the report by Amadeus and Henley Centre Headlightvision, the business segment will increase significantly, due to further world globalization and a rapid increase of world trade. The study forecasts that the amount of business travellers in business class will increase from 17% in 2005 up to 33% into 2015. Also the number of people taken seven or more flights will rise from 6% in 1997 up to 14% in 2015 (Amadeus and Henley Centre Headlightvision 2008). Other research underlines the declining trend in business class travel since 2000 (Mason and Alamdari 2007). The KLM emphasizes the trend of business passengers to down grade to economy class, economy comfort class or even to low cost airlines (Heini 2010). Also studies performed by Air France indicate this trend. In 1996 34% of the business travellers on medium haul flights on Paris was travelling business class, this percentage decreased until 9% in 2007 (Matheu 2010).

Another ongoing trend in aviation is the ongoing digitalization of the traveller. The effect of digitalization is twofold. On the one hand side the digitalization of the traveller influences the travel experience. Nowadays already 57 percent of all European travelers conducted online self-check and the use of self service check in machines, e-tickets and online booking is increasing steadily (Arthur D Little 2008). Social media are an often used method in the airline industry for the communication between airlines, airports and customers (Airlinetrends.com 2011). Also Van Der Most emphasizes the impact of digitalization on tourism and believes it will increase in the coming decades (Van der Most 2011).

On the other hand the evolvement and familiarity with IT technology also changes the demand. Video conferencing has become widely applied (Amadeus and Henley Centre Headlightvision 2008). Producers of systems for video conferencing had a high demand in recent years, especially during the credit crunch and the economic down turn followed (Dos Reis Miranda 2011).
Linked to this development, is the evolution of the generation Einstein. These are the people born after 1985, they grew up and are educated in the digitalized environment. This generation will enter working life in the next years and will be the future business traveller. It can be assumed that, because of their experience with IT, they expect air traffic to be different, more driven by IT technology. Although the mentality of this generation can differ from the mentality of other generations, the size of this generation is not different (Boschma and Groen 2006).

4.3 What are the major uncertainties in air travel for Schiphol airport?

Previous paragraphs described the major socio economic trends influencing aviation on the longer term. In this chapter the uncertainties, related to these trends, are examined. The differences between trends and uncertainties sometimes seem to be somewhat arbitrarily. While both trends and uncertainties may have a large impact on the business in the long term, trends tend to have a smaller degree of uncertainty. The effect of the trend is more or less known in advance and the existence can be assumed. At the same time the level of uncertainty for uncertainties is high. The existence of a distinct effect may not be assumed even as the inexistence (Wulf, Brands et al. 2010). Due to the known distribution of ages in the developed world, we may assume that the amount of elderly people on airports will grow. Because of the low level of uncertainty this is considered to be a trend.

Due to the inconsistencies between trends, a major uncertainty can reveal. The distinction between trends and uncertainties in this study is based on the interviews supplemented by literature. In particular the differences in opinion between the interviewees indicated a high level of uncertainty. Especially the subjects of de-hubbing, low cost development, the scarcity of resources and the effect of environmental awareness were input for many discussions (Appendix 3 Formal Interviews).

4.3.1 De-hubbing

In earlier days Schiphol had a favourable position in the European air travel market by their geographical position and the extensive number of bilateral agreements arranged by the Dutch government. Many of these structural advantages Schiphol does not have anymore, combined with the limited population size of the catchment area the vulnerability for de-hubbing in the future increases (Heerkens 2011).

De-hubbing is known as “partial or complete abandonment of a hub by the dominant carrier” (Redondi, Malighetti et al. 2010). In the period from 1997 until 2009, 37 airports from a total of 123 hub airports worldwide were de-hubbed, meaning that they lost at least 75% of their number of connections. Network restructuring, mergers, downsizing and bankruptcy were the main causes of these de-hubbing examples (Redondi 2011). In Europe there are many examples of de-hubbed airports like Brussels and London Gatwick, but also partly de-hubbed airports like Zurich and Copenhagen. The research by Redondi, emphasizes the difficulties of re-hubbing (Redondi 2011).

De-hubbing is considered as an uncertainty, because the effect and he existence for Schiphol on the long term is unknown. It is composed out of a set of separate uncertainties and trends influencing the aviation industry and in particularly Schiphol airport:

- Urbanization
- The development of smaller longer range airplanes
- The rise of new competitors (mainly Middle Eastern carriers)
- The introduction of the Emission trading scheme
- Deregulation
- The dependency on the hub carrier Air France KLM

Urbanization

Urbanization can be measured in the percentage of people living in cities. The urbanization trend, that has been going on in the last decades will continue in the next decades. The world’s
urbanization already increased significantly from 29% in 1950 until 49% in 2005 (Petersen, Sessa et al. 2009). Urbanization is getting more important in developing countries but also in Europe further urbanization is forecasted. According to the report “The future of transport” in 2007 72% of the European citizens were living within urban areas, this percentage is expected to increase up to 84% in 2050 (Directorate-general for energy and transport 2009).

Also the report “Schiphol bewegen en verbinden” concludes the importance of urbanization on aviation. According to this report it is expected that in the year 2030 at least 60% of the total world population will live in urban areas with a size of at least 5 million inhabitants (Veldman 2009 ). For the developing world an increase of 9.9% is expected to 55% in 2030 (Roland Berger Strategy Consultants 2011).

Through the ongoing urbanization new market possibilities do arise for air travel. Larger cities are generating enough traffic to connect without a hub airport. This could result in more point to point traffic. Doganis emphasizes that as a result of this trend, the long haul point to point traffic will know the biggest growth potential, from different segments, in the upcoming years (Doganis 2010).

An increase in the amount of point to point traffic will damage the position of the network carriers operating via one hub. Feeders will lose their market share in regions where as an airport is directly connected with other international airports.

**Hub bypassing**

The ongoing urbanization will create new demand by the growth of cities. At the supply side, new cost efficient smaller planes are developed by Boeing and Airbus. The Dreamliner (Boeing 787) and the Airbus A350 are developed to serve smaller long haul routes, increasing the risk for hub bypassing. Nowadays US airlines are already flying immediately to the bigger cities in Europe, without making use of a European hub. With the introduction of smaller long range airplanes they can even serve smaller cities from their hubs directly and will bypass the European hub airports. European airlines will do the other way around. Because of the large number of orders for these new aircraft, it can be expected that some hub bypassing will take place.

Figure 13 shows some random city pairs indirectly flown by members of the Skyteam alliance. In the new situation these cities can be flown by making use of a single hub instead of a dual hub. The consequence is a shorter travel time and more convenience. The damage for airlines, those anticipating on this trend, will be small, because the total amount of passengers transported will be the same or even higher, due to the increase in convenience. Hub airports, however will lose an amount of travellers, after all one hub airport is used in the new situation instead of two.

Critics stress the existence of A380’s and other larger aircrafts at airlines which indicates the importance of trunk routes, the routes between two bigger hubs (Veldhuis 2011). They also state that although some bigger cities can be connected directly still a lot of smaller cities exist that cannot (Cornelisse and Pronk 2011).
Dependency on Air France KLM

Compared to other competitive airports (London Heathrow, Paris Charles de Gaulle), the network offered form Schiphol is extensive for the amount of people living in the catchment area. Factors contributing to these successes were the aviation policy of the Dutch government and the market strategy of the KLM (De Wit and Burghouwt 2009). Since the merger of Air France-KLM in 2004 the dependency of KLM on Schiphol became smaller.

Although mergers and alliances in recent years led to the expansion of multi hub networks, overall a single hub network is in general profit maximizing due to the concentration of services and economies of scale and scope. There are many examples of airport in the vicinity of their primary hubs that are de-hubbed (London Gatwick, Basel, Clermont Ferrand). Also Copenhagen lost many of their flights to Frankfurt (Veldhuis 2011).

A multi hub network becomes feasible when different geographical markets are served, when there is a lack of capacity at the primary hub or with the existence of a large local market. During the merger of Air France- KLM agreements between the Dutch government obliged the airline to serve 42 city pairs from Amsterdam and to develop both hubs equally until 2012 (Burghouwt). Currently there are no indications for a movement of flights from Schiphol to Paris (Veldhuis 2011).

Nowadays all requirements for serving a dual hub system are met. Air France-KLM seems to specialise more on their hubs by substituting destinations from one hub and increase the frequency of that destination on another hub. Also the capacity at Paris is restricted and there is a large local market in the Netherlands.

However, the enhancement of the cooperation between Air France-KLM and Alitalia together with the potential cooperation with other airlines increases the vulnerability because of the increasing number of inefficiencies in operating a multi hub system. Air France already announced a new corporate structure to shift more control to a new entity in Paris (The Wall Street Journal 2011). Meanwhile, the amount of passengers at Alitalia’s hub airport in Rome grew impressively (Eurostat 2011).

New competitors

A major threat for home carrier KLM is the rise of new competitors, mainly from the Middle East (De Wit 2011). Especially the expansion of Emirates airlines is remarkable. On its way to become the world’s biggest airline in the world it was the most profitable airline in 2010 (HHL Leipzig Graduate School of Management 2010). The accelerated growth of these carriers can be attributed to a number of factors; low expenses for salary, low tax levels, a good geographical position low fuel...
prices and unlimited access to their hub airports. Experts often indicate the disturbance of the level playing field by the uneven advantages Middle Eastern carriers have in comparison with other carriers (Cornelisse and Pronk 2011; De Wit 2011).

Recent research demonstrated that the influence of these carriers is limited to a certain sets of markets (De Wit 2011). However with the ongoing expansion can extend this to a new set of markets.

The risks for hub carriers like KLM and Lufthansa are bigger than for other airports as these airlines are more depended on the feeder system of the main carrier. At the same time the Middle Eastern carriers focus on connecting smaller airport by their hub with the rest of the world (De Wit 2011).

Deregulation

Although the opening of the European market and the open skies agreements between the US and Europe indicate something else, intercontinental air traffic is still heavy regulated (HHL Leipzig Graduate School of Management 2010). Nowadays most of the bilateral agreements between European Union member states and countries outside the EU are discussed by the EU. In 2008 70% of all markets flown from the European Union had accepted the community rights (Reichmuth, Ehmer et al. 2008). The regulatory environment stays in the future a large uncertainty, as the availability of traffic rights can support traffic demand(Kim, Poponak et al. 2010).

Traditionally the Netherlands and its airlines had a favourable position upon other countries and airlines in discussing traffic rights. With the entrance of the European open sky and the ongoing power shift in discussing traffic rights to the European Union as a whole this advantage dissapaered. Opening of the markets worldwide make it possible to fly directly from one country to all cities in another country, without capacity, frequency or price limitations. In recent years home carriers acted as a partner for non-home carriers by making use of their feeder system to transport passengers. Eventually the feeder system could loose passengers to the direct flights which are possible by further deregulation. The reduction of the number of feeders will affect Schiphol as KLM’s business model will function anymore, as a result de-hubbing could take place.

In the past the liberalization has been seen as a main market driver for air travel demand (Franke and John 2011; Tinseth 2011). Also interviewees acknowledge that the availability of traffic rights will influence the demand of the emerging economies in Asia (Cornelisse and Pronk 2011; Heerkens 2011). Especially the market in India is still heavily regulated an opening of this market will create new opportunities for European airlines (Cornelisse and Pronk 2011).

Emission trading scheme

Due to the on-going discussion about the exposure of greenhouse gasses, the European Commission decided to adopt an emission trading scheme for the air sector. Although the outlook of the Emission trading scheme is not yet clear, there is a potential disturbance for air traffic.

As Van Der Zwan argues, the introduction of the ETS could lead to a shift of traffic by European hubs to hubs in Africa. Carriers like Ethiopian and Kenya Airways are doing well at the moment and are expected to rise in the future (Van der Zwan 2011). Also Middle Eastern hubs will be preferred unlike the European hubs. European hubs loose competitiveness compared, which will strengthen the risk of de-hubbing.

Depended on the price per emission, transfer traffic will become less profitable in the future. Therefore the impact will be bigger at airports that are depended on their transfer traffic, like Schiphol. The ETS will eventually stimulate point to point traffic within Europe instead of hub operations which could cause de-hubbing.

The uncertainty about the environmental protection measures, affecting the airline industry, is high. Experts disagree heavily with each other on this subject.

The overlapping trend of environmental awareness itself will not only contribute to de-hubbing it will also affect air traffic itself. It can be considered as major uncertainty; in 4.3.3 Environmental awareness different considerations and uncertainties will be discussed.
Concluding, this paragraph discussed a number of events that can contribute to de-hubbing of airports. Although these scenarios seem a little bit melancholy, all events described are likely to occur. Only the impact of each events, the effect of them together and the consequences for Schiphol and other European airports are unforeseen.

Airlines can escape from de-hubbing, by serving smaller destinations via their hubs, for example Stuttgart-Manila or Stavanger- Los Angeles (Kuipers, Manshanden et al. 2007). As discussed in the introduction, there is a limited amount of airports that overcome de-hubbing. While solutions for de-hubbing have to be researched, key indicators for de-hubbing should be developed and monitored. Meanwhile policymakers at Schiphol have to continuously consider the balance between keeping the main customer satisfied versus attracting and satisfying smaller or new customers.

4.3.2 Low cost development

The development of low cost carriers, other call them low fare or no frills companies, started in the 90’s based on the US business models of South West and Valuejet. Their success is based on offering a low level of service, having high passengers’ loads and quick turnaround times. Low cost airlines nowadays mainly operate as point to point carriers, transporting O&D passengers with one or two types of airplanes across Europe (Buffaerts 2006). The establishment of low cost airlines in Europe had direct consequences for airports. Major hub airports experienced more competition of regional airports. As one of the few major European hub airports, Schiphol has a considerable percentage of low cost flights, induced by the number of available slots, the vicinity of Amsterdam and the relative small amount of traffic fees. Although the expansion in recent years was impressively, the development of this segment into the future is uncertain. Schiphol’s operations will be influenced by the future development of this segment.

Low cost development at an airport is dependent on a number of factors. Warnock-Smith and Potter determine in their paper a number of choice factors for low cost carriers:

- The size of the catchment area and the attractiveness of this area for tourism and business
- Slot capacity
- Quick turnaround times
- Aeronautical charges

(Warnock-Smith and Potter 2005).

The low cost airlines were the winners of the economic downturn in the early 2000’s. With their low fares they were able to attract customers while other airlines saw a decrease of the number of travellers. To compete with low cost airlines the network carriers lowered their price levels by simplifying their service levels. During the credit crunch, and the crisis followed, this effect was less obvious, as the low cost market also reaches maturity (Franke and John 2011). As the market is evolving consolidation in this market is expected to follow. It is expected that in Europe three to four major low cost carriers will survive (Doganis 2011).

A further cost convergence between low cost airlines and network carriers will also take place. The network carriers will restructure and consolidate while low cost carriers will have to pay higher wages and offer more services to attract business passengers (HHI Leipzig Graduate School of Management 2010). The difference in costs for wages between full service carriers and low cost carriers is enormous. Research indicated that European low cost airlines are usually spending between 19% and 15% while full service airlines are spending almost the double between 31% and 36% (Buffaerts 2006).

In the near future the largest network airlines will increasingly focus on long-haul at mega-hubs, while mid-Smaller network airlines will reduce long-haul network and focus on regional niche markets. The smaller regional airlines have to focus on thin niche markets. At the same time the Low cost carriers will more and more dominate short haul. The non-traditional markets like the low cost market will percentage-wise increase the most in the coming years (Doganis 2010).
Synergies between low cost and network carriers can also be expected in the future. There are already some examples of cooperation in the US. Until now in Europe it is limited to subsidiaries of major carriers like Iberia and Vueling, Transavia and KLM. These examples demonstrate the willingness of people to use low fare companies as feeder for ICA flights (De Wit 2011). Also Forsyth stresses the possibilities of alliance forming between low cost and network carriers. Existing alliances are composed of different network carriers, while integrating networks by introducing low cost airlines, will be more powerful to the future (Forsyth, Niemeier et al. 2011).

For the cooperation between low cost airlines and hub and spoke airlines, new facilities are needed to support this trend and to provide seamless travel; among others ticket and baggage issues (Heerkens 2011).

South West airlines in the States is already transferring passengers to connecting long haul flights. Passengers from and to the bigger, high frequency flown US destinations, can transfer flights at network carriers hub airport’s. Some airports in Germany also provide this service (Reichmuth, Ehmer et al. 2008).

Figure 14 pictures the distribution of flight duration and the level of expectancy over time. Business class travellers’ expectation starts to rise at almost 1.5 hours. Meaning that below the 1.5 hours the level of expectation is minimal. For economy class passengers this is at almost 3 hours. For smaller trips travellers do not seem to expect a high service level.

![Figure 14 Comparison of flight duration and the customer expectation of KLM travellers (Heini 2010)](image)

While low cost carrier Easyjet is increasingly focusing on business passengers, offering flexible fares and new connections (Easyjet 2010), Ryanair pleas to become more customer focused, trying to attract a new range of customers (Airlinet 2011).

The low cost market at Schiphol expanded heavily in the last decades (Figure 15). Since a few years the percentage of low cost passengers at Schiphol is varying between 10% and 12%. Schiphol was the first destination outside the UK for Easyjet and the company is currently one of the biggest low cost carriers flying from Schiphol. A special pier is developed to handle low cost carriers cost efficient with quick turnaround times. In the future plans an low cost hub for at least one low cost airline is expected (Ter Beek 2011).
The percentage of low cost passengers’ seats in the Netherlands is, compared to most of the neighbouring countries small.

Concluding, the future development for the low cost segment in Europe is very uncertain. Experts foresee new developments in the low cost segment resulting into consolidation within the sector, more customer focus, attracting new passenger types and creating synergies with hub airlines. The role of Schiphol airport in the low cost segment is uncertain as well. On the short term a further expansion of low cost carriers’ flights at Schiphol is expected. Compared to other major European hub airports, Schiphol provides diverse opportunities for low cost carriers. The vicinity of Amsterdam, the small low cost penetration in the Dutch market, the relative limited amount of landings fees and the available slot capacity shape the airport as a potential low cost hub. Shifts in the low cost business, like an extensive cooperation between network carriers and low cost carriers, could reshape operations at Schiphol airport.

### 4.3.3 Environmental awareness

Influenced by the ongoing discussion about climate change, the European commission adopted “the climate change package” in 2008, aiming to reduce CO2 and related greenhouse gasses with 20% in 2020. All transports modes have to reduce emissions (Airports Council International 2010). At the same time the IATA proposed a plan to grow carbon neutral (stabilizing CO2 emissions) by 2020 and to reduce the emissions in 2050 by 50% compared to the year 2005 (European Commission 2010). Also the Copenhagen report by the United Nations prescribes the ambition of cuts in global emissions (European Commission 2010).

Air travel is responsible for 2% until 3% of CO2 emissions and also a significant amount of other greenhouse gasses (Owen, Lee et al. 2010). This amount is forecasted to increase exponentially in the near future (Peeters 2011).

The report “The future of interurban transport” considers environmental taxes, regulations and emission trading schemes as the most influential factors to influence air travel growth. Key issue in this study is the pass through of costs to the consumers. The report describes different studies that calculate the loss of air traffic demand from 0,7% up to 3,7%, depended on the pass through (Gillen 2009).

The growing environmental awareness can be seen as a threat for the aviation industry, as the industry is not able to easily reduce the emissions. Policy measures forced by governments to reduce the emissions will influence the demand for airline industry and, depending on the substance of these measures, will disturb the level playing field in world aviation. Airports might also be influenced by this increasing awareness, especially if these measures are only opposed in Europe. On the other hand airlines and airports could respond to this trend by adapting climate neutral policies.
One of the policy measures agreed to by the European Commission is the introduction of the emission trading scheme for the aviation industry. At the moment there are a lot of unknowns about this scheme. European airlines prefer the introduction of the scheme worldwide, as they airlines are worried about the disturbance of the level playing field by the ETS, when the system does not include all airlines (Cornelisse and Pronk 2011). Some of the interviewees do think the ETS could heavily influence Europe’s air traffic system (Van der Zwan 2011), while others think that the price of the emissions will not restrict air travel (Peeters 2011). The effects of the ETS system are unpredictable. Possible behavior could be the development of hub airports in Africa (Van der Zwan 2011), the elimination of hub traffic within Europe and a reduction of competition in transfer traffic.

According to critics, an open system, in which emissions can be traded between different industries, still allows the airline industry to double its emissions to 2035, according to the paper “Can tourism deliver its “aspirational” greenhouse gas emission reduction targets?” A closed system, or a system with a cap to the maximum of emissions is preferred (Scott, Peeters et al. 2010).

4.3.4 Economic growth and globalization

Economic growth is essential for the growth of air transport demand. In recent years the airline industry was negatively influenced by economic down turns. At the moment the world economy seems to be unpredictable. Due to globalization the cross border trade in goods, services and capital rose enormous. The growth of cross border trade is expected to growth further and will be 80% higher in 2020 than nowadays (Amadeus and Henley Centre Headlightvision 2008). Although the high dependency of air travel on economic growth, the market showed to recover after a period of economic downturn (Ter Beek 2011). A longer down turn can become a more serious problem for the airline industry. The cyclicity of the industry resulting in big losses during downturns and marginal profits in an upwards economic situation do make the industry very vulnerable for adversity (Doganis 2010). Other related uncertainties are inflation and overheating of the emerging economies in Asia (Bouman 2010).

4.3.5 Scarcity of resources

Another major uncertainty for the aviation industry is the scarcity of resources, mainly the scarcity of oil. Emerging markets in especially India, China and the Middle East drive the demand as they will be accountable for 87% of the growth in oil consumption up to 2030 (Airneth 2010). Many studies are projecting a higher and volatile oil prices to the future (European Commission 2010).The volatile oil prices were reflected in the oil price of 147 per barrel in the summer of 2008, followed by an oil price of 34 Dollar per barrel in February 2009. The production peak of crude oil is expected in 2030 (European Commission 2010). The dependency on oil producing countries is big, Iran, Iraq, Kuwait, Saudi Arabia and the United Arab Emirates provide 65% of the world’s oil reserves (Airneth 2006).

As the fuel costs are predicted to be 20% of total costs volatile prices can influence the ticket price seriously (Veldhuis 2011), reflecting in a changing demand. Air transport, especially the non-business sector, is elastic for price changes. At the moment alternatives for oil are rarely, as many of the bio fuels proved to be economically and ethically inefficient (Peeters 2011)

4.3.6 Consolidation

The airline industry is known for its cyclic pattern of revenues and losses. Some year of profits are followed by a number of losses, making it a very cyclical industry (Doganis 2010). According to Bruffaerts the high costs and the small profit margin of nearly 3% are very problematic for the aviation industry (Buffaerts 2006). Also Doganis points out that the heavy competition in the airline industry together with the small margins and the sensitivity to exogenous events makes the airline industry very vulnerable. In recent years airlines joined alliances, merged, sold subsidiaries, did code
sharing, made joint ventures etcetera, to become more sustainable profitable over time (Doganis 2011).

![Figure 16 Different forms of alliance cooperation (European Commission and the United States Department of Transportation 2010)](image)

**Figure 16 Different forms of alliance cooperation (European Commission and the United States Department of Transportation 2010)**

There are several reasons for airlines to join alliances. Route networks can be extended and linked with other airlines’ networks, airport check in facilities can be shared and brand recognition is improved (European Commission and the United States Department of Transportation 2010). Meanwhile mergers and acquisitions in air transport stay problematic because of the bilateral service agreements negotiated between countries (Forsyth, Niemeier et al. 2011). The challenge to grow profitable for airlines will also continue in the next decades (Kim, Poponak et al. 2010). Further cooperation between airlines and other alternative measures will emerge. According to Heerkens, more mergers and acquisitions will follow in the airline industry (Heerkens 2011). The changing landscape will influence the demand on certain routes and at certain airport which could possible impact Schiphol.

### 4.3.7 Miscellaneous

In the previous paragraphs the major uncertainties for the future are discussed comprehensive. In this paragraph shortly some other trends will be described. These trends are expected to have less impact on the long term at Schiphol.

The terrorism attacks in 2001, the SARS epidemic and the credit crunch all had their effect on air traffic demand. These events do have a deterrent effect on an increasing number of “anxious customers” (Amadeus and Henley Centre Headlightvision 2008). On the longer term the effect of one exogenous event is limited. The decline of travel demand after the credit crunch and the recession for example, was pursued by a high increase after the recession after which the growth rate of before the credit crunch continued (Ter Beek 2011). Though, the existence and the impact of exogenous events will stay uncertain into the future.

In the competition with the low cost airlines, network carriers tend to develop a more customized product. A further differentiation is expected over all segments. One of the examples of such differentiation is the luxurious KLM flight to Houston. More regional developments are also expected (Heerkens 2011).

### 4.3.8 Sub conclusion trends

In Appendix 5 Causal relationship diagram, a simple causal relationships model is given. There are many uncertainties that influence the trends identified in chapter five directly or indirectly. The causal relationship model gives an overview of the influences these uncertainties can have. Often it is
the combination of uncertainties that creates another, even higher uncertainty. In the following table the different uncertainties are indicated. They are ranked upon impact on the long term and level of uncertainty on a qualitative scale; low, medium, high. Both impact level and level of uncertainty is form problem owner’s perspective. An uncertainty in the industry can become an uncertainty for Schiphol.

The level of uncertainty and the impact is defined on behalf of the interviews. Some of the trends were not mentioned in the interviews and are therefore scaled based on the description in literature. A measure for the level of uncertainty was the agreement or disagreement between the experts in the interviews. Van der Zwan for example, emphasized that the impact of ETS could become very high while other experts had completely other thoughts. Agreement between the interviews indicated a smaller level of uncertainty.

<table>
<thead>
<tr>
<th>Uncertainty</th>
<th>Impact</th>
<th>Level of Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Emission trading scheme/</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>environmental awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exogenous events</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Globalization</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Hub carrier dependency</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Deregulation</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Low cost development</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>New airplanes</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Product differentiation</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>New competitors</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Oil price</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>World Economy</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Urbanization</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 5 Overview of the trends and their level of uncertainty, based on the literature review and the interviews

Many critics emphasize the non healthy economical performance of airlines and the need for consolidation (Doganis 2011). The impact of consolidation is different for every airport and dependent on the airline. The introduction of an emission trading scheme within Europe is discussed heavily. The outlook of the system is relatively uncertain even as the impact. European airlines are afraid for the disturbance of the level playing field in the world (Cornelisse and Pronk 2011). Experts foresee different effects of the scheme (Peeters 2011; Van der Zwan 2011). Meanwhile Peeters addresses the extensive problems for the aviation industry in case of an increase in environmental awareness (Peeters 2011). Exogenous events have a small impact on the long term is low but they are very unpredictable.

Globalization will continue into the future, the impact for airlines is larger than the impact for airports. As one of the main customers the impact of the KLM at Schiphol is high. At the same time a further centralization of power in the Air France-KLM group increases the uncertainty for Schiphol. Low cost development is expected by many of the experts (De Wit 2011; Heerkens 2011). The question is where and how. For airports with low cost activities, such as Schiphol, there will be some impact.

Both Airbus and Boeing develop large passengers’ planes and smaller long range planes for both point to point connections and hub and spoke networks. There might be an impact for airports on the longer term, this predictability is relatively high.

As the Middle Eastern carriers are growing enormous, some routes will encounter heavy competition. The effects for airports in Western Europe are still limited; however the future prospects are unsure.
Model
5. Forecasting method

In the previous chapter the main trends and uncertainties were determined. This chapter will examine the impact of those trends under influence of five different scenarios. These scenarios are composed out of the uncertainties identified in chapter four. By making use of different forecasting models the impact of these scenarios on the three trends will be examined. The question that this chapter addresses is; what are the influences of the three trends at air traffic at Schiphol under the different scenarios?

To answer this question two types of forecasting models have been developed. In this report the outcomes of these models are discussed. A more in depth description about these models, together with an overview of other models and an extensive guide about how to create these models, is integrated in the second part of this report.

5.1 Model choice

Current forecasting models and methods are not eligible for use in this research for different reasons. Most of them lack the ability to do long term forecast for emerging trends. Others are not available or not free to use. A number of model requirements have been opposed by the problem owner for the model:

- Adaptable/ Flexible
- Easy to understand
- Is designated for the market at Schiphol
- Robust
- Suitable for the long term planning
- Should take uncertainty into account
- Insight in the underlying factors
- Quantitative

In his book “Flying of Course” Doganis introduces a scheme to identify the proper demand modelling method (Doganis 2010). As the model should give insights into underlying factors, a causal model is required. Doganis distinguishes two types of causal models in its book; regression analysis and gravity models. Both methods are based on the assumption that air traffic is a derivative of other activities (the activity approach) (Doganis 2010). In this study both models were used. They will be described briefly here.

Regression models

Regression analysis is widely used in air transport demand forecasting. The demand of air traffic is a function of more independent variables, often air fare, a measure of income and a time function (Doganis 2010). By means of a regression analysis the relation between dependent and independent variables can be described. The dependent variable can be forecasted or explained by means of a set of independent variables. The least square method is used to minimize the sum of the residual squares and to optimize the regression function. In this study multiple regression will be applied, the basic formulation for a this function is (Hair, Black et al. 2006):

\[ Y_1 = C + \alpha X_1 + \beta X_2 + ... \]

A constant is often incorporate in the equation above to identify the number of passengers. Overall, airline forecasting regression methods often consider the relationship between independent variables multiplicative instead of additive. By introducing logarithmic functions in the equations the multiplicative effect can be expressed in a linear function with u as the error term (Doganis 2010).

\[ \log Y_1 = K + \alpha \log X_1 + \beta \log X2 + n \log Xn \ldots + u \]
The $R^2$ coefficient is used for measuring the closeness of fit between the data and the model (Doganis 2010). If this coefficient is high on the historical data it may be assumed that the explanatory value for the future is also high.

Literature defines a six step approach for regression analysis (Hair, Black et al. 2006). This approach consists of the following stages:

- **Stage 1:** Objectives of multiple regression analysis
- **Stage 2:** Research design of a multiple regression analysis
- **Stage 3:** Assumptions in multiple regression analysis; homosedasticity, multicollinearity, normality
- **Stage 4:** Estimating the regression model and assessing overall model fit
- **Stage 5:** Interpreting the regression variate
- **Stage 6:** Validating the results

The same approach is used during this study and is described in detail in part two of the report.

Regression analysis has also some drawbacks. First, it is based on past trends and does not incorporate shifts in the future. Secondly, regression analysis uses forecasts of underlying independent factors to determine the forecast for the dependent factors. These forecasts of independent factors already include errors, which will increase the error of the final forecast significantly. Third, there is a risk of multicollinearity, meaning that independent factors are correlated. Last, it is difficult to determine emerging trends as a regression model analysis requires many data.

In this research the regression model for the emerging markets uses data from the APG database. The APG database provides the historical data of flights based on the bookings of representative travel agencies. Emerging trends are hard to analyse based on data from a single airport (Graham 1999); that is why the whole Western European region is used. For single airport, often a limited amount of data is available. Next to this, the data of a single airport is often depended on strategic decisions by the main carrier.

The data derived from the APG database begins on January ’05 and ends with Jun ’11. The data comprises all flights from the top 10 airports of Europe (Table 6).

<table>
<thead>
<tr>
<th>Airport Code</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHR</td>
<td>London</td>
</tr>
<tr>
<td>CDG</td>
<td>Paris</td>
</tr>
<tr>
<td>FRA</td>
<td>Frankfurt</td>
</tr>
<tr>
<td>AMS</td>
<td>Amsterdam</td>
</tr>
<tr>
<td>LGW</td>
<td>London</td>
</tr>
<tr>
<td>BCN</td>
<td>Barcelona</td>
</tr>
<tr>
<td>FCO</td>
<td>Rome</td>
</tr>
<tr>
<td>MAD</td>
<td>Madrid</td>
</tr>
<tr>
<td>MUC</td>
<td>Munich</td>
</tr>
<tr>
<td>ORY</td>
<td>Paris</td>
</tr>
</tbody>
</table>

**Table 6 Overview of the top ten airports from the APG database**

**Gravity model**

During the analysis, the regression analyses were inadequate in forecasting different segments for the emerging economies (Report part 2); therefore a new model had to be constructed. For forecasting traffic on new routes gravity models are frequently applied in the air traffic industry. These models incorporate independent variables like population size, GDP development, price,
frequency and travel time or distance (Doganis 2010). For this research, integrating the average fare is problematic because it is very much depends on competition, fare classes and route density and cannot be forecasted for the long term (Grosche, Rothlauf et al. 2007).

In this research the determinants oil price, distance, GDP development and population size are used. Oil price can be linked to the ticket price as this is determined to a large extent by fuel costs. Gravity models distinguish attraction factors like population size and GDP development, from factors of resistance like distance and price.

Gravity models are typically used for identifying demand in new geographical markets; generally a gravity model is applied to one or a few other markets to derive parameters for the gravity function. With the help of this gravity function the demand for air transport can be calculated for new markets. In this research four gravity models are created to define the gravity function. Two models focus on the transfer market while, two other models do take the O&D market into account. The OD models have the form of following equation:

\[ V_{CN} = \frac{\alpha \times (Population_{China} \times Population_{Netherlands} \times GDP_{China} \times GDP_{Netherlands})}{(Oil \ Price \times Distance)^{\beta}} \]

The Transfer gravity model is as follows:

\[ V_{CN} = \frac{\alpha \times (Population_{China} \times Population_{Western\,Europe} \times GDP_{China} \times GDP_{Western\,Europe})}{(Oil \ Price \times Distance)^{\beta}} \]

Here is \( V_{CN} \) the volume between China and the Netherlands or India and the Netherlands. The socio economic indicators for population size, GDP development and the oil price are provided by global institutions and databases like the United Nations, the World Bank and Global Insights. These institutions create forecasts for these parameters up to 2040.

The constant \( \alpha \) and \( \beta \) are determined by researching other markets at Schiphol. The parameters \( \alpha \) and \( \beta \) are estimated in four models, two of them incorporate the US market and Japanese market from 1992 until 2009. The other two are estimated for the years 1992, 1996, 2000, 2004 and 2008 in the Latin America, Canadian, Japanese and US market at Schiphol. Long haul markets are preferred as they have lot in common with the Chinese and Indian market.

The gravity model contains demand parameters to estimate the volume between China and India and Schiphol. Supply parameters also play an important role in the definition of the volume. The availability of traffic rights is one of the key supply parameters in air transport. An extensive list of supply and demand parameters has been given in part II of the report. Because supply parameters are hard to quantify and integrate in a model, they are excluded from the model. The forecast will be compensated afterwards for this failure.

In Table 7 an overview has been given for the four gravity models and their parameters.
The $R^2$ indicates the match of the function with the data it is based upon. As the two models do have fairly the same behaviour the US&Japan models are preferred above the Four regions for further usage in this study. When the parameters are integrated in the function it will look as follows.

$$V_{CN} = \frac{0,00791 \times Population_{China} \times Population_{Netherlands} \times GDP_{China} \times GDP_{Netherlands}}{(Oil \ Price \times Distance)^{0,885072}}$$

### Data sources
Both models are dependent on data and forecasts of independent variables like GDP and population size. Data sources that have been used for the construction of the model are:

- Global insight database; this database is widely used in forecasting research and provides forecast and historical data for important socio economic variables (Bhadra and Kee 2008; FAA 2009)
- Centraal Bureau Statistics; The Dutch statistics department provides data about the Netherlands and forecasts
- Eurostat; provides European data
- Worldbank; economic historical data
- United nations; world population historical data and prospects
- OECD; data from all OECD member states and some important non member states
- Schiphol group; forecast models, traffic reviews, passenger insights

### Sub conclusion model choice
In part II of the report the whole process of creating the forecast models is discussed in detail. After building and validating the model some conclusion can be drawn:

- The regression analysis method is well suited for the definition of the ageing trend
- Both regression analyses performed on the transfer market for India and China demonstrate divergent behavior and will not be used further in this study
- The regression analysis for the Chinese market outperforms the gravity model, while the gravity model is in line with other forecasts, as shown during the validation
- The regression analysis and the gravity model for the Indian market match with each other, though both models outperform other forecasts

More information about the underlying assumptions is discussed in part II of the report. Although validation showed the inability of the Indian gravity model to forecast the future flows, this model is used during the scenario analysis. It should be kept into account that the uncertainty in its model outcomes is larger than for the other models. For the Chinese market the gravity model is preferred, as it matches other forecasts.

### 5.2 What is scenario analysis?
The question that this paragraph addresses is; how can we take uncertainty into account in the forecasts?
The separate uncertainties, as discussed in chapter four, are combined in scenarios. It is impossible to forecast the future exactly; many of the everyday’s uncertainties can be explained by the inability of seeing into the future. Forecasting gives insights into the future by using data and patterns from the past. Although it is impossible to forecast the future exactly, it is possible to explore the future situations to support decision making (Grundy 2008). In general three types of uncertainties can be distinguished. At first there are risks with historical precedent. For this risks can be expected what will happen and what are the probabilities on a certain or uncertain outcome. Secondly, there are the structural uncertainties. There are no likelihoods available for these risks because they are unique. The third categories are the unknowables. In this category even the event is unknown (Van der Heijden 2005). As the third category of uncertainties cannot be defined, this research focuses on identifying uncertainties from the second and third category.

This research will use scenario analysis to handle uncertainty in long term forecasts. In scenario analysis a number of feasible descriptions of the future, “scenarios”, can be identified. Management can make informed decisions based on an overview of the uncertainties they do have (Bunn and Salo 1993). As Van Der Heijden (2000) argues, a scenario is a plausible future; the whole set of scenarios give an insight about what is determined and predictable in the system and what is not (Van der Heijden 2000). Scenario analysis is often used method in transport policy making (Annema and De Jong 2011). The strategy of the organization should fit within the changing environment. A changing environment consists of parts that cannot be predicted but also of factors that can be foreseen. Scenario analysis is used for dealing with this uncertainty and ambiguity (Van der Heijden 2005).

By making use of scenarios, solutions can be divided in robust and flexible ones. The solutions with a positive effect in all scenarios are robust solutions. Solutions with a different effect in a number of scenarios are flexible solutions.

![The Rosenhead Trumpet; an overview of uncertainty over time (Environmental Council)](image)

**Figure 17 The Rosenhead Trumpet; an overview of uncertainty over time (Environmental Council)**

The degree of uncertainty increases with time if it can change more than we can foresee in the near future (Rosenhead Trumpet). On the short term uncertainties are limited and foreseeable, while at the long term we cannot foresee the uncertainties and the amount will be large (Environmental Council).

Literature also distinguishes what is called wild cards or shocks. These events do have a very low probability of occurrence, though the effect of these events will be huge. An example of a similar event is the attack of 11 September 2001. Saritas describes the concept of wild cards in his paper as “those surprise events and situations which can happen but usually have a low probability of doing so but if they do their impact is very high” (Saritas and Smith 2011). A few examples, related to this
research, are the volatility of the Chinese market, another crash of financial markets and new terrorism attacks in aviation. Because of the low likelihood of occurrence it is nearly impossible to anticipate on these events, moreover although these shocks have a huge effect, the impact on the long term is limited. These wild card scenarios are excluded from this study, but should be taken into account in the decision making.

Van der Heijden identifies a number of principles for scenario building in his book “The art of strategic conversation”. These principles are:

- There should be at least two scenarios while, because of issue with practicality, no more than four scenarios are allowed.
- Scenarios should be plausible
- Scenarios should be internally consistent
- The scenarios should be relevant for the problem owner
- The scenarios must provide new perspectives

(Van der Heijden 2005)

These requirements are kept into account in this study.

5.3 Scenarios

For this research five scenarios are composed. Except from the first one the scenarios are described narratively. After every scenario narrative the model outcomes for this scenario are discussed. For every scenario also an indication has been given about the total market share at Schiphol and the number of travellers for the three segments discussed. This indication is not based upon an in-depth analysis but simplifies the data retrieved from Schiphol’s own forecasts.

5.3.1 0-Scenario

The 0-scenario characterizes itself by a balanced growth of Schiphol airport; it is the expansion of the current situation with the projected growth. The number of international connections will grow steadily with the market demand. The low cost segment will be stable over time and no other shifts in the industry will take place. Schiphol will not suffer of competition; meanwhile it will also not gain more market share.

The 0-scenario assumes the correctness of the forecast data provided. This is the so called reference trajectory of the model.

Impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP development Europe</td>
<td>Stable</td>
</tr>
<tr>
<td>Low cost airlines</td>
<td>Stable</td>
</tr>
<tr>
<td>Oil price</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Table 8 Key effects 0-scenario

Figure 18 demonstrates the effect of ageing at Schiphol airport. This effect is dependent on the percentage of 65+ populations in Western Europe and in the United States, the GDP development of Western Europe, the low cost development at Schiphol and the Oil price. The graph shows the percentage of 60+ travellers at Schiphol. In this scenario this percentage will increase tremendously up to 30% in 2040.

Whereas the elderly have more to spend compared with other segments they are less price sensitive. The percentage of elderly is negatively influenced by an increase of the low cost segment.
In Figure 20 the number of elderly as a percentage of the total number of passengers is shown. The number of passengers in both markers will increase significantly, in 2025 there will be 3.5 Million passengers travelling between Schiphol airport and China. This is a more than threefold increase compared to the current amount. The Indian market will lack behind but will know an accelerated growth after 2025.
Figure 20 Number of elderly and total elderly based on Schiphol’s own forecast in the 0-scenario

Figure 21 pictures the market share of the Indian and the Chinese market. Also the market share of this market is expected to increase in this scenario.

Figure 21 Market share Chinese and Indian market at Schiphol based on Schiphol’s own forecast

Table 9 gives an overview of the performance in the 0-scenario.

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly travellers</td>
<td>4.7</td>
<td>16.0</td>
<td>35.0</td>
</tr>
<tr>
<td>% Elderly travellers</td>
<td>10%</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>Chinese market</td>
<td>1.1</td>
<td>3.5</td>
<td>7.7</td>
</tr>
<tr>
<td>% Chinese market</td>
<td>2.7%</td>
<td>4.8%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Indian market</td>
<td>0.5</td>
<td>1.7</td>
<td>4.9</td>
</tr>
<tr>
<td>% Indian market</td>
<td>1.0%</td>
<td>2.4%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

Table 9 Overview for the year 2010, 2025 and 2040 for the market share and the number of travellers (millions) for the 0-scenario

35
16.0
35.0
12
5.3.2 De-hubbed airport

Due to the double dip in the economy in the second decade of the 21st century and the slow recovery after, many airlines went bankrupt or had to merge to continue their business. In an early stage Alitalia joined the Air France-KLM group; later Czech airlines decided that they could only survive under Air France.

The reorganizations needed for the different mergers and acquisitions did not have the effect where was hoped for. Lufthansa, the biggest competitor and backed by the large German market, is steadily increasing market share in the European market. While the yields are under pressure Air France decides to get rid of their multi hub strategy in Europe and focuses on two hubs; given the efficiency of less hubs and their wide range of smaller long distance airplanes available.

Although the performance of Schiphol airport is much better and the brand KLM has internationally a great value, Air France decides to cut most of the long haul flights from Schiphol. According to the CEO, “Schiphol is too much in the vicinity of Paris and Amsterdam is lacking attractiveness as a tourist destination. To keep the Randstad connected we will increase the frequency of high speed trains to Charles de Gaulle”.

Rome on the other hand just increased capacity and is a hot spot for worldwide tourism. With the extension of the Italian high speed railway system and the connection to the airport, the airport’s catchment area has also increased significantly. Media are suggesting that the Italian president in a tête-à-tête with his French colleague discussed the position of Rome in the Air France group network, pressured by the aggressive labour unions in Italy.

As a consequence Schiphol will lose most of the KLM intercontinental flights. 40% of all intercontinental flights will be closed within a year. The other 60% will be closely monitored. Expectations are that only 10% of the total number of intercontinental flights will survive on Schiphol. These are flights to bigger attractive cities like New York, Singapore and Hong Kong, flights to former Dutch colonies Paramaribo, Curacao, Aruba, Jakarta and the leisure flights to exotic destinations such as Bali and Havana.

Other airlines try to fill in the gap that arises at Schiphol airport. Emirates airlines for example is increasing the capacity to two A380 flights from and to Dubai a day, while Lufthansa and British Airways are increasing their feeders from Schiphol. Other airlines, partners in the Skyteam alliance, also terminate some of their routes to Schiphol because they are lacking a feeder to fill them. The total number of intercontinental passengers will decline at Schiphol airport.

Because of the decline in the economy Western governments cut the pensions to save money. The elderly people, in the past an emerging segment, lost their budget to spend on travel. The number of trips per person is decreased. Since the Air France group decided to eliminate the largest part of the intercontinental flights from Schiphol elderly in the Netherlands’ are travelling less on intercontinental flights, as they prefer to fly directly. The elderly association in the Netherlands publicly demonstrated against the removal of the brand KLM as it would decrease elderly familiarity with travel.
Impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP development Europe</td>
<td>-1%</td>
</tr>
<tr>
<td>Low cost airlines</td>
<td>25% market share</td>
</tr>
<tr>
<td>Oil price</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Table 10 Key effects of de-hubbing

Whereas the forecast models are based upon a situation in which the KLM is an active international hub airline at Schiphol the KLM will no longer use Schiphol as their main hub in the de-hubbing scenario. Therefore the models lack the ability for forecasting traffic in this scenario.

Qualitative conclusions, on the other hand, could still be formulated. The percentage of elderly travelling at Schiphol will increase due to the economic downturn. At the same time an increase of the amount of low cost carriers, by a lack of competition, is assumed.

Whereas the percentage of elderly travellers might increase the total number of travellers will probably decrease, especially on the short term. In this case the total number of elderly travellers will decrease as well.

Whereas the de-hubbing scenario seems to be much unintended for Schiphol it offers also opportunities. De-hubbing will make Schiphol less dependent on the KLM. Schiphol will be able to create an own strategy. Other international airlines will be more likely to integrate Schiphol within their network.
5.3.3 Elimination of feeders

Easyjet is the first European low cost charter in Europe, subsidiaries excluded, that joined an alliance. After the successes of cooperation between network carrier Delta and low cost carrier South West in the United States, Easyjet joined the Skyteam to achieve a better competitive position in the very profitable market of Great Britain. By joining the Skyteam Easyjet started a new business model in aviation together with Air France-KLM. They are replacing the larger part of the KLM feeder service from the UK to Amsterdam and are planning to do the same for other destinations. While the KLM is concentrating on the long haul and some medium haul flights, Easyjet attracts new markets by transporting transfer and business passengers. Passengers seem to do not bother the decrease in the quality of service on European flights. On board services on KLM’s short distance flights were downgraded the last years anyway. Both airlines benefit from this combination, as a part of the cost inefficient feeder system of the KLM is replaced by the cost efficient routes of Easyjet. The cooperation with the KLM is offering Easyjet more demand by transfer and business passengers, a network of international destinations and a larger number of frequencies on many routes.

A very advanced pricing system is introduced by both airlines to equally share costs, earnings and profits over a certain percentage of passengers and routes. IT systems are integrated with each other and Easyjet adapted its baggage policy for transfer passengers. By combining both “best practises” the airlines will retain higher yields and an above average degree of utilization. Other carriers are directly prejudiced by the introduction of this new business models. There is a lack of similar low cost fare airlines in Europe that can perform the same task. After extensive negotiations between Lufthansa and Ryan Air both airlines concluded their business models are too much apart from each other. By words of Lufthansa CEO, “Ryan Air is too much focused on secondary airports and refuses to do promises on upgrading services for business class passengers”.

Schiphol, since a few years a main hub in the Easyjet network, gets the privilege to facilitate the change in business models. Piers have to be adapted to make it suitable for the faster turn around and baggage systems have to be approved. The cooperation between Easyjet and the KLM gave them a huge monopoly position at Schiphol, almost 80% of all flights are performed by Easyjet or a member of the KLM group, Skyteam flights are not included.

The expansion of the KLM network is focused on the emerging economies in Asia. Over the past two years Schiphol is connected with five new long haul destinations in Asia, three in China and two in India. At the same time the frequency to other Asian destinations has been increased. The number of Asian travellers at Schiphol is also increasing, positively influenced by more capacity on the Asian routes. Due to the combination between KLM and Easyjet the percentage of business transfer travellers from Asia has increased significantly, as they do value luxury services more than Europeans. Because of the lower connection fares offered the percentage of leisure passengers from Asia increased. Other passengers on Schiphol are complaining about the large groups with Chinese people speeding to their connecting flight.

In the Netherlands the ageing trends is on its top, but the percentage of elderly at Schiphol is steadily declining. Especially the European segment even as the transfer segment knows a decline of elderly people travelling. Tourist associations blame the cooperation between Easyjet and KLM for this behaviour. They underline the need for comfort on board and argument that most elderly passengers prefer to fly from smaller airports since the luxury services at Schiphol has disappeared. Contrary to the other segments, the international O&D segment of elderly people is still increasing.

Although the future for the KLM-Easyjet combination is promising, both CEO’s are still questioning themselves about the right balance between connectivity and fare. Nowadays only the larger...
European destinations are connected by Easyjet. These are flown more than three to four times a day, which makes connections times rather short. Longer connections times are compensated with a lower fare. It seems that not all Schiphol destinations are suitable for a feed by Easyjet.

In recent years a small decline of the business passenger segment was already determined. Although this decline was merely compensated by the increase in non-business travel, profit stabilized because of the lower yields for non-business traffic.

**Impact**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP development Europe</td>
<td>Stable</td>
</tr>
<tr>
<td>Low cost airlines</td>
<td>25% market share</td>
</tr>
<tr>
<td>Oil price</td>
<td>Stable</td>
</tr>
<tr>
<td>Compensation China/ India</td>
<td>-5%</td>
</tr>
<tr>
<td>Overall Schiphol traffic</td>
<td>+0.2%</td>
</tr>
</tbody>
</table>

Table 11 Key effects elimination of feeders

Figure 22 indicates the effect of the growing low cost market at Schiphol. The percentage of elderly travellers at Schiphol decreases slightly in respect to the 0-scenario. Meanwhile there is still a large percentage of elderly travellers compared with nowadays. Due to an increase in overall traffic the total amount of elderly will also increase (Table 12). The forecast model lacks the ability to include some future shifts. It can be expected that the future elderly will be more used to flying with low cost airlines. Nowadays low cost airlines already tend to customize their product more. As these developments are not integrated in the model, the real impact of an increase in low cost segment at Schiphol could be smaller.

![Figure 22 Effect of scenario elimination of feeders on ageing](image)

Figure 22 Effect of scenario elimination of feeders on ageing

Whereas KLM will offer an improved product they will be able to attract more market share in the Chinese and Indian market. As it is hard to estimate how much the KLM will benefit from such an cooperation the estimation of 5% might be to conservative. For Schiphol airport, a cooperation between Easyjet and KLM will distinguish them from other airports. The only disadvantage is that it might attract other people to the airport that spend less money.
The market share of the Indian and Chinese flow is more or less equal to the 0-scenario. Though the amount of passengers will be increase because of a higher total amount of Schiphol travellers.
Table 12 Overview for the year 2010, 2025 and 2040 for the market share and the number of travellers (millions) for the elimination of feeders scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly travellers</td>
<td>4.7</td>
<td>15.5</td>
<td>35.2</td>
</tr>
<tr>
<td>% Elderly travellers</td>
<td>10%</td>
<td>21%</td>
<td>29%</td>
</tr>
<tr>
<td>Chinese market</td>
<td>1.1</td>
<td>3.6</td>
<td>7.9</td>
</tr>
<tr>
<td>% Chinese market</td>
<td>2.7%</td>
<td>4.8%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Indian market</td>
<td>0.5</td>
<td>1.8</td>
<td>5.2</td>
</tr>
<tr>
<td>% Indian market</td>
<td>1.0%</td>
<td>2.5%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>
5.5.4 Booming business

Whilst the European economy is doing well, the Asian economies are expanding heavily. Although there is a risk of inflation, the growth rates of Asian economies are high above expert’s expectations of years ago. The air traffic demand from Asia is also booming. The restrictions by the higher oil price, caused by the continuous development of the Asian countries, limit the growth somewhat, but the potential of the Asian market is that big, air traffic demand from Asia is still enormous. The growing middle class in Asia is increasingly interested in travelling to Europe, as it has been seen as a symbol of their status. Globalization and the acquisitions of European companies also enhanced the number of travellers in the business segment.

Air France-KLM is still operating a dual hub strategy, using the brand value of both brands. Further specialisation of the hubs took place in the last years. With the lack of capacity at Charles de Gaulle Schiphol is chosen as a hub for most of the flights to India and China. After the entrance of Jet airways to the Sky team, a couple of years ago, and the opening of the Indian market for all European airlines, the number of passengers from India travelling by Schiphol is increased tremendously.

With the specialisation of Schiphol as the Asian hub, the larger Asian carriers also find their way to the airport. Most of these carriers belong to the Sky team alliance, the number one alliance in Asia. In the near future the China flow is expected to increase even further. Experts are suggesting that within a reasonable amount of time the flow to China will be bigger than the US flow from Europe.

The demand for airports in Europe is far above the supply of airport capacity. The conservative-liberal government in the Netherlands, already 12 years in power, gave Schiphol enough freedom to expand. Schiphol’s expansion is focused on the intercontinental and feeder flights whereas the low cost flights are out placed to Amsterdam Flevopoint, the new airport in Flevoland that replaced the old one and that is directly connected with Amsterdam by a light rail system.

Although the low cost carriers differentiated some of their products and made it better suitable for the elderly, 60+ people tend to fly by the popularly called “elderly airport” (Schiphol) because of the high level of service offered by airlines and airport. Due to the on-going economic growth in recent years, the just retired baby boom generation, is spending their money on travelling. Meanwhile a large number of well-organized tour operators for elderly are in business, offering all kinds of exotic places. A report by the CPB in the Netherlands, recently announced that the wealth under elderly never been higher in Western Europe. Also Western European elderly are travelling more via Schiphol, as they prefer the luxurious atmosphere on the airport.
Impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP development Europe</td>
<td>Stable</td>
</tr>
<tr>
<td>GDP Development China/ India</td>
<td>High (+1%)</td>
</tr>
<tr>
<td>Oil price</td>
<td>Increase (10%)</td>
</tr>
<tr>
<td>Total Schiphol traffic</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Table 13 Key effects booming business

As the economy in Europe stabilizes the percentage of elderly travellers will not change over time, this percentage is just slightly affected by the increased oil price. The demand on the Chinese and Indian flow though will be influenced heavily, especially on the longer term. Although this scenario knows a year on year increase of 1% in the GDP growth the sensitivity to GDP in emerging economies is important since the forecasts and the actual values might fluctuate over time. This can also been perceived in the forecasts of Boeing and Airbus. The forecasts of both carriers have huge shifts between subsequent years of more than 1% in flows to and from emerging economies like China.

![Figure 26 Market share for the China and India flow in the booming business scenario](image)
Figure 27 Effect of booming business at the Indian flow

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly travellers</td>
<td>4.7</td>
<td>16.0</td>
<td>35.0</td>
</tr>
<tr>
<td>% Elderly travellers</td>
<td>10%</td>
<td>21%</td>
<td>29%</td>
</tr>
<tr>
<td>Chinese market</td>
<td>1.1</td>
<td>3.0</td>
<td>7.7</td>
</tr>
<tr>
<td>% Chinese market</td>
<td>2.7%</td>
<td>4.1%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Indian market</td>
<td>0.5</td>
<td>1.9</td>
<td>6.2</td>
</tr>
<tr>
<td>% Indian market</td>
<td>1.0%</td>
<td>2.6%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Table 14 Overview for the year 2010, 2025 and 2040 for the market share and the number of travellers (millions) for the booming business scenario
5.5.5 Sustainable world

All hurricanes and flooding had their effect on public opinion in Europe. In a well-organized European wide demonstration they managed to attract the interest of policy makers and other European citizens. Following up a European referendum has been held where the majority vote to restrict all industries in their exposure of greenhouse gases. The airline industry is heavily influenced by this decision as it does not have the technology advancement like other industries had in recent years, but still has to drop levels significantly. It is the next drawback for the airline industry, after the continuously increase of the oil price.

The European commission took the result of the referendum very seriously and announced plans to cut the emission rights right away and making compensation less profitable. Due to the scarcity of emissions in the trading system prices increase. The price increase had a tremendous effect on the airline industry in Europe. In a response to the European system, the United States also adopt a similar system. Other countries are rejecting to cooperate.

The overall demand of traffic collapsed, as it became too expensive for many leisure passengers to travel. Traffic by hubs in Europe declined exponentially, especially traffic at the hub airports with a small origin and destination market like Frankfurt and Schiphol. Many of the traffic at these airports shifted to airport at the borders of the European Union; Istanbul, Moscow, Cairo and Dubai are exploding in their number of passengers. Airlines flying from these airports do have a significant advantage above other airlines. A passenger flying directly from China to the Netherlands will have to compensate the flight entirely, while a passenger flying by Istanbul only has to compensate the route between Turkey and the Netherlands. Even the Kenya airways and Ethiopian airlines hubs in Africa are performing very well; connecting the growth markets of South America and Asia.

The airplanes manufacturers breaking records with the manufacturing of large airplanes as big trunk routes are developed to be more cost efficient.

Schiphol airport is one of the most suffering airports worldwide, the dependency on transfer traffic and being secondary hub in the Air France-KLM alliance almost became fatal. A large amount of the intercontinental and continental flights disappeared by the collapse in demand. The numbers of intercontinental routes that still exist are the connections with the larger O&D business and touristic markets like New York and Hong Kong and to former Dutch colonies. The intercontinental leisure flights disappeared as well. Due to the decline in network of Air France-KLM by the shrinking demand, the group decided to lose its dual hub strategy. In Europe, Schiphol airport only accommodates routes to the bigger European destinations and some routes to leisure destinations.

The growth of Asian travellers to Europe stagnated and even declined in recent years. The economies are still emerging strongly, however with the increase in price an airplane ticket is no longer affordable for the growing middle class. Most passengers from these countries immediately fly to their first destination and make use of road and train transport within Europe. Amsterdam is often not on their list with places to visit as it is not on the way between London, Paris and Rome.

The travel market for elderly people is no longer booming. Although the wealth under elderly is still large, the airplane tickets are priced too high. Elderly more and more plan to travel by bus or by car. Because of the high ticket prices, the many one week or just a few days trips, are changed into long trips of a few weeks so now and then. Elderly still prefer the destinations that can be reached non-stop. Stop overs in non-Western countries are absolutely non discussable for most of them.
Impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP development Europe</td>
<td>Stable</td>
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<tr>
<td>GDP Development China</td>
<td>Stable</td>
</tr>
<tr>
<td>Oil price</td>
<td>Stable</td>
</tr>
<tr>
<td>Environmental charge</td>
<td>+50% to Oil price</td>
</tr>
<tr>
<td>Overall Schiphol traffic</td>
<td>-2%</td>
</tr>
</tbody>
</table>

Table 15 Key effects Sustainable world

Elderly tend to be less price sensitive than other passengers segments, therefore the percentage of elderly will increase. However as the overall amount of Schiphol traffic will decrease the total amount of elderly will decrease as well. The question that arises is if the model can be applied by an enormous price increase.

![Figure 28 Effect of scenario sustainable business on the ageing trend](image)

Figure 28 Effect of scenario sustainable business on the ageing trend

Whereas the percentage of elderly might benefit from a levy the amount of Chinese and Indian passengers will decrease substantially. In this graph is not taken into account that the Chinese incomes will be much lower than the Western European ones, a price increase will influence them harder.
Table 16 Market share Chinese and Indian market in the Sustainable world scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly travellers</td>
<td>4.7</td>
<td>16.0</td>
<td>35.0</td>
</tr>
<tr>
<td>% Elderly travellers</td>
<td>10%</td>
<td>23%</td>
<td>31%</td>
</tr>
<tr>
<td>Chinese market</td>
<td>1.1</td>
<td>2.6</td>
<td>5.7</td>
</tr>
<tr>
<td>% Chinese market</td>
<td>2.7%</td>
<td>3.6%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Indian market</td>
<td>0.5</td>
<td>1.2</td>
<td>3.4</td>
</tr>
<tr>
<td>% Indian market</td>
<td>1.0%</td>
<td>1.7%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Table 17 Overview for the year 2010, 2025 and 2040 for the market share and the number of travellers (millions) for the sustainable world scenario
Synthesis
Chapter 6. Results of the forecasts
For every single trend these paragraphs will subsequently address the following questions:
- What are the main findings from this study?
- What does this mean for the Master plan?

The knowledge obtained from the forecast models and the scenario analyses is processed in the answers above.

Table 18 and Table 19 summarize the main conclusions from the previous chapter. The number of elderly is fairly the same over all scenarios, except from the de-hubbing scenario. The impact of de-hubbing will be smaller for the amount of elderly than for the number of travellers to China and India.

<table>
<thead>
<tr>
<th></th>
<th>0-Scenario</th>
<th>Elimination</th>
<th>De-hubbing</th>
<th>Booming</th>
<th>Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly</td>
<td>16</td>
<td>15.5</td>
<td>Decline</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Elderly %</td>
<td>22%</td>
<td>21%</td>
<td>Constant</td>
<td>21%</td>
<td>23%</td>
</tr>
<tr>
<td>China</td>
<td>3.5</td>
<td>3.6</td>
<td>Decline</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>China %</td>
<td>4.8%</td>
<td>4.8%</td>
<td>Decline</td>
<td>4.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>India</td>
<td>1.7</td>
<td>1.8</td>
<td>Decline</td>
<td>1.9</td>
<td>1.2</td>
</tr>
<tr>
<td>India %</td>
<td>2.4%</td>
<td>2.5%</td>
<td>Decline</td>
<td>2.6%</td>
<td>1.7%</td>
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</tbody>
</table>

Table 18 Overview of the scenario analysis for 2025 (amount of passengers in millions)

<table>
<thead>
<tr>
<th></th>
<th>0-Scenario</th>
<th>Elimination</th>
<th>De-hubbing</th>
<th>Booming</th>
<th>Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly</td>
<td>35</td>
<td>35.2</td>
<td>Decline</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Elderly %</td>
<td>30%</td>
<td>29%</td>
<td>Constant</td>
<td>29%</td>
<td>31%</td>
</tr>
<tr>
<td>China</td>
<td>7.7</td>
<td>7.9</td>
<td>Decline</td>
<td>7.7</td>
<td>5.7</td>
</tr>
<tr>
<td>China %</td>
<td>6.7%</td>
<td>6.5%</td>
<td>Decline</td>
<td>6.7%</td>
<td>5.1%</td>
</tr>
<tr>
<td>India</td>
<td>4.9</td>
<td>5.2</td>
<td>Decline</td>
<td>6.2</td>
<td>3.4</td>
</tr>
<tr>
<td>India %</td>
<td>4.3%</td>
<td>4.3%</td>
<td>Decline</td>
<td>5.4%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Table 19 Overview of the scenario analysis for 2040 (amount of passengers in millions)

6.1 Ageing
The main conclusion of this research is that the number of elderly travellers at Schiphol will increase heavily in the next decades. In particular in the next 20 years the percentage of people aged 60+ will rise enormous. Until 2025 the model forecasts more than a doubling of the current percentage of aged 60+ passengers at Schiphol and up to 2040 a threefold increase. All the experts emphasized the impact of this trend in the future as well.

The sensitivity analysis indicated a very little sensitivity for changes in the independent variables, meaning that the ageing trend is more or less autonomous for errors in the forecasts of the independent variable. From the regression function can be concluded that, over all segments, ageing seems to be less price sensitive than other segments. Also the dependency on economic growth is smaller under elderly travellers. Of course these parameters are relative and might change with a very high price increase or a higher and on-going decline of the economic growth. An expansion of the low cost segment at Schiphol will slightly hinder the increase in the percentage of elderly travellers. This is in line with the expectations from literature and interviews that elderly travellers prefer the more luxurious way to travel. At the same the share of elderly can be reduced by a further
expansion of the low cost segment which attracts more price sensitive customers. Although the actual percentage of elderly travellers differs through the four scenarios, the heavy growth of this segment is present in all scenarios. The forecast model cannot be applied in the de-hubbing scenario; whereas the model is based on an international hub airport the parameters in the regression analysis will not match de-hubbing. However based on the regression function, literature, interviews and the predictions for ageing worldwide it may be assumed that, also in the de-hubbed airport, the percentage of elderly travellers will increase. In the second scenario, “the elimination of feeders”, the percentage of elderly travellers is slightly hindered by the expansion of the low cost segment at Schiphol. Hereby should be added that the perception of elderly towards low cost carrier may change over time. On the longer term the parameters of the regression function could change, resulting in another distribution. Based on the existing regression function the percentage of elderly travellers will increase in the fourth scenario, “sustainable world”. However, a large increase in price of the ticket can have another effect than forecasted in the regression function. After all, elderly may be less price sensitive at the end they have a finite budget.

As the amount of elderly (60+) travellers will approximate one third of the total amount of passengers, they will become a very important segment at Schiphol with specific needs and requirements. Although the impact of ageing is dependent on the uncertainties as described in the scenarios the increase of the percentage of elderly travellers is forecasted between roughly 2.5 times and 3.5 times the current percentage. For Schiphol the increase in elderly travellers can also be seen as chance, as elderly travellers are willing to spend more money to services and do have a higher value for the airport’s quality. In the Master plan specific attention should be paid towards satisfying the elderly customer. Hereby should kept into account that today’s elderly travellers will differ from the future ones. Future elderly will probably have a higher budget, are more digitized, are more used to flying, do have more intrinsic motivation to travel the world and are on average in a better health. More research towards the future elderly is required.

6.2 The Chinese Market

Both the forecasting model and the qualitative analysis define an increase in the number of Chinese passengers in the coming years at Schiphol. Until 2025 a threefold increase in the number of passengers on the China flow is expected under 2 of the 5 scenarios. The exponential growth of this number is expected to continue afterwards.

Although both qualitative analyses and the quantitative analyses indicate the huge potential of the Chinese market the forecasts for the coming years keep fragile. In comparison with the ageing trend the uncertainty within the independent variables (population size, economic growth, oil price and ticket price) is higher as shown in the sensitivity analysis. Also the scenarios analysis emphasizes the uncertainty within the forecasts. Both models are unavailable for usage in scenario of de-hubbing because underlying assumptions are based on an international hub airport. It may be assumed that the influence on the Chinese market will be negative. The catchment area might be large enough for the bigger destinations in China; direct connections to smaller destinations will disappear. The exact effect in terms of de-hubbing on the number of Chinese passengers is unpredictable. The low cost development in the third scenario will improve Schiphol’s competitive advantage in terms of price. By an improved competitive position in the European market, Schiphol will attract a larger share of the Western Europe to China traffic. In the booming business scenario, the whole flow between Western Europe and China will increase by the increasing demand derived by the higher economic growth. The higher economic growth will strongly affect the growth of the middle class in China. The growing middle class will be the accelerator for air travel demand from China. As argued the propensity to fly will increase heavily at a GDP of 15,000. USD per capita. In the fifth scenario, the sustainable world, the growth will be interfered by the levy opposed by the European Commission. Although the forecast models are able to measure the effect of the levy on the trend, the models cannot determine the effects of strategic behaviour such as the use of African hubs and the increase of Middle Eastern Carriers and hub airports at the borders of the European Union.
The uncertainty in the Indian market is large. Whereas the Chinese market is well developed at Schiphol the Indian market is not. The Indian market opened up around 15 years after the Chinese one, the disposable income is still small and the market is still heavily regulated. During the validation phase of the model, both the gravity model and the regression function differ from other forecast. There could be multiple reasons for this. For now it can be assumed that the development of the Indian market is more uncertain and delayed upon the developments in the Chinese market.

Both the regression analysis and the gravity model determine a growth in this market. However this growth will start to accelerate after 2025. There are also large discontinualities in the compensatory...
factor for the model. A new research next year of the year after to the Indian market is required to increase the certainty of the forecasts.
For now, the Indian market is forecasted to grow by 4 of the 5 scenarios. Although the relative growth seems to be high the total amount of travellers seems to be limited, especially compared to the Chinese market. As indicated, projections from Boeing and Airbus forecast an even lower amount of passengers up to 2030.
Chapter 7. Implications

This research monitored the trends and uncertainties for Schiphol and in the aviation industry that will shape the future traveller. The outcome of this research can be applied for defining new services for the Master plan in 2025. By means of this research robust solutions can be distinguished. Robust solutions and services are valuable during all the scenarios.

The ageing of passengers is a trend that will certainly continue no matter what scenario is applied. Although the effect will increase or decrease in a number of scenarios, the influence of ageing on the passengers at Schiphol will always be present. Except form de-hubbing all scenarios show an enormous expected increase in the number of elderly. The number of elderly travellers in the de-hubbing scenario is uncertain. The risk for these events has to be considered with the investment decisions for services and new designs for this passenger’s type.

Service directions for the future customer are for example care at the airport, more seamless travel, easy to understand information, easy accessibility and another retail product aiming on the elderly traveller.

The development of the Chinese and Indian market is dependent on a large number of supply factors. The route network of KLM and the Sky team membership of Indian or Chinese partners are factors Schiphol is not able to influence.

The scenario of de-hubbing is the end game for most of the Chinese and Indian flight at Schiphol, while the environmental awareness could influence this market heavily.

On the other hand the predicted growth of the Chinese and Indian market at Schiphol is huge. The potential in terms of population size and economic growth are tremendous.

Serving the Chinese and Indian passenger’ needs can improve the status of Schiphol abroad and directly influence the amount of passengers willing to travel by Schiphol. At the same time the uncertainty regarding to this developments requires flexible solutions. For the median long term the growth of the Chinese market at Schiphol is more certain than the Indian. Investments with a restricted budget or flexible solutions can easily be done.

A new retail concept, like a Chinese tea-house, new products in the existing retail stores and the availability of hot water will improve Schiphol’s image and meanwhile do not need large expenses. The size of the Indian market at Schiphol is nowadays too limited. The exponential growth in this market will probably occur after 2025. For the Master plan there seems no need to keep the Indian traveller in mind. However, due to the potential and the expected growth of the Indian market it is wise to continuously monitor the presence of this market at Schiphol.
Conclusions
Chapter 8. Conclusion & Recommendations

8.1 Conclusion

The main research question of this study was:
“Who are the future travellers to which Schiphol airport should improve their quality to be ahead of the competitors up to 2025 and beyond?”

Based on a qualitative research two trends were identified that will shape the future traveller: the ageing trend and the emerging economies. The ageing trend emerges especially in the developed world, whereas the baby boom generation, the low fertility rates, the improved healthcare and the low death rates increased the number of elderly people. At the same time the future elderly are highly motivated to travel, do have more money to spend, are on average in a better health, more digitized and are more acquainted with air travel and the low cost market. The increase of elderly people in the developed world will impact the percentage of elderly travellers at Schiphol. This results in a doubling of the percentage 60+ aged passengers at Schiphol until 2025 which will continue afterwards. With a high level of certainty can be defined that the percentage of elderly at Schiphol will be between 25% and 35% in 2040. For the de-hubbing scenario the percentage of elderly travellers is hard to determine by the forecast model.

This study also researched the Chinese and Indian markets, both markets belong to the BRIC-countries, the largest emerging economies. The Indian and Chinese markets have the biggest potential in terms of air transport based upon their population size and projected economic growth. In recent years the flow from Schiphol to China experienced an impressive growth. The main conclusion from the forecast model is that until 2025 an exponential increase of the Chinese traveller is forecasted. This results in at least a fourfold of travellers between Schiphol and China. After 2025 the growth of the Chinese market will only accelerate. The uncertainty of this growth is reasonably high. This research defines a number of wild card scenarios that will hinder this exponential growth on the medium long term, for example a double dip in the European economy or a bubble in the Chinese real estate market. Meanwhile the exponential growth is neither fixed under all scenarios. In de-hubbing scenario Schiphol is abandoned by the main hub carrier. Although the forecast model is not able to determine the real value in such a scenario a decrease in international flights to China seems to be obvious. Concluding it can be stated that whereas the forecast model forecast an exponential increase of passengers on the China flow the uncertainty in this increase is reasonably high.

In the Indian market at Schiphol met a decline in recent years. The forecast models forecast an exponential growth up to 2040, though this growth will be delayed in respect to the growth of the Chinese market. Main reasons are the heavy regulated India aviation sector and the lower disposable income in India. There are a number of wild card events that will hinder the exponential growth of air traffic to India, though the Indian economy is less export oriented than the Chinese one and seems to be less vulnerable for a bubble. At the same time de-hubbing will for the Indian market at Schiphol probably have the same disastrous effect as for the Chinese market. As the position of Schiphol within the Chinese market is well established in Western Europe the position in the Indian market is not. Meanwhile British airports have a traditionally good position in this market and the competition of Middle Eastern airports is high. Concluding, although the potential is enormous the growth of the Indian market at Schiphol is uncertain. If a large exponential growth will start it will impact Schiphol probably after 2025.

Concluding, to answer the main research question; the future traveller distinguishes of the current one that there will be a large percentage of elderly people. Also the Chinese market at Schiphol is likely to rise, although the uncertainty is reasonably high. The development of the Indian market will happen later and is less certain at Schiphol.
8.2 Recommendations

Based on this research strategic decisions could be taken by Schiphol for the Master plan. Up to 2025 the forecast models determined an increase of the passengers to and from China and an increase in the percentage of elderly travellers. As the emergence of the ageing trend has a high level of certainty, the rise of the Chinese market has not.

More research to the specific needs of the aged traveller is needed. Hereby should be taken into account that the future elderly will differ from the current one. With a high level of certainty can be assumed that the impact of ageing will be high at Schiphol. Therefore Schiphol should actively define new services for elderly in their Master plan. Passenger needs and requirements of the elderly traveller can be used to support the terminal quality.

The Chinese customer will also change over time. While nowadays especially Chinese pioneers will visit Europe it will become more common for all Chinese, especially with the rise of the Chinese middle class. The Chinese passenger does differ a lot from other passengers by its culture and language. Specific research to their needs is also needed. As the development of the Chinese market is less certain, the development of specific Chinese oriented services to improve terminal quality is less robust. On the other hand Schiphol could actively attract market share in Western Europe when it improves the quality for his specific segment. If it’s too late this competitive position is lost to other airports. It is for the decision makers to keep the balance between risk and investments for the new Master plan. The most anxious scenario, the de-hubbing, will not happen suddenly so Schiphol should be able to anticipate on this trend.

This research uses the scenarios to determine the bandwidths of three trends and their effect on aviation at Schiphol. From the scenarios can be concluded that de-hubbing could have a major impact on these trends. Nowadays there are no signs of the de-hubbing of Schiphol and most other European airports have limited slot capacity left. On the long term, with the on-going consolidation and changing environment this scenario may come true. To prevent this from happening and actively anticipate, Schiphol should monitor the independent variables for de-hubbing and de-hubbing as a whole. Some of these independent variables Schiphol should actively influence by for example political pressure. As Schiphol is in close contact with the Dutch politicians they could try to stop de-hubbing from happening.

Meanwhile Schiphol should research re-hubbing possibilities and make the airport less vulnerable for de-hubbing. While it seems to be that de-hubbing can have a major impact at Schiphol, the solutions for de-hubbing are limited. To anticipate on this hazard, Schiphol should develop strategies to be used in case of de-hubbing and mitigating measures to reduce the effect of de-hubbing.

The uncertainty analysis, supported by the scenarios, demonstrated the potential developments in the low cost market at Schiphol airport. The development described; the cooperation between network carriers and low cost airlines will be a next step in the evolution of the low cost industry. Many experts forecast the low cost segment to grow and consolidate and to cannibalize some of the market shares of the network carriers on intra European routes. As argued in the second scenario the market position of Schiphol will benefit from a similar cooperation between low cost airline and hub carrier. Schiphol can perfectly anticipate on this uncertainty. As described in the report, German airports, already tried to facilitate the transfer between long haul flights and low cost intra European flights, while this transfer is common in the United States. With the potential establishment of a low cost base at Schiphol and with the ongoing growth in this segment, the potential of this development should be researched more into depth. A feasibility study should give more insights into the opportunities and threats of these developments. Schiphol will have to decide about the role they would like to play. In the meanwhile solutions for, among others, baggage transfers, ticketing and labelling have to be invented.
At this moment the outlook of the ETS system is unknown. An increase in costs can have a major effect for developing countries as the disposable incomes are lower. The effect of the ETS on air traffic should be closely monitored for these markets. Schiphol could also actively anticipate on the environmental awareness trend.

As the growth rates of emerging markets fluctuate heavily over time this research should be performed yearly. Companies like Boeing and Airbus have yearly fluctuations of .5% in their 20 years forecasts of traffic flows. For the effect of the emerging markets at Schiphol a yearly research is preferred. The gravity model develop is easily adaptable by integrating new data. For the regression model new and more recent data will increase the reliability of the forecast. The ageing trend is more reliable and does not need the same frequency of research.

Although the growth of the Indian market at Schiphol in recent years has been small, it represents an enormous potential. Nowadays the Indian market is integrated in one of the 22 markets defined by ASF. Therefore it would be wise to implement India as a single market in the forecast model.

For developing trends it is suggested to use the Western Europe data more often, because more reliable predictions can be obtained.

The demand of Indian passengers at Schiphol for the future is uncertain. In the meantime Schiphol should focus on researching other emerging economies and their potential. Next to the other BRIC countries, Russia and Brazil, also 11 other emerging economies are defined. Indonesia for example, does belong to these N11 countries and has traditionally tight relationships with the Netherlands. When new data is available a more certain factor for the compensation can be estimated. For the Chinese market Boeing and Airbus expectations seemed to be a good guidance for validation.
Chapter 9 Reflection

9.1 Reflection on the project

This paragraph discusses the shortcomings and considerations of this project. These are often related to the chosen system boundaries and the research methods applied. The paragraph distinguishes general comments, interview related, model related and scenario related comments.

General comments

Forecasting future developments in the air traffic industry, especially on an airport level is very difficult. The aviation industry is a very complex ever changing industry, where a large number of external factors influencing air traffic are very unpredictable (Doganis 2010). This research defines trends and uncertainties for the future up to 2040. The vision of the airline industry and Schiphol specific might be very different within 10 years. By means of scenario analysis the uncertainty within the coming 30 years is taken into account in this research. Van der Heijden makes a difference between known unknowns and the unknown unknowns (Van der Heijden 2005). The scenario analyses define the first category of known unknowns. This category, composed by the information from literature and interviews, gives a restricted vision of major known unknowns. The outcome is dependent on the input of the semi structured interviews. Although the seven experts had a wide variety of backgrounds there exists a risk of mutual influence. Especially since many of the experts are Dutch and active in the relatively small Dutch aviation sector. The second category of unknown unknowns cannot be taken into account. Due to the complexity in the air traffic market this category will be large. Although they cannot be taken into account they could heavily change this market, leading to other sstem behavior as forecasted in this research.

Next, the performance of an air traffic market at an airport specific is dependent on a large number of supply and demand factors. The most important demand factors are integrated in this research. The supply factors, on the other hand, are taken into account less thoroughly. Especially in the development of air traffic at a single airport other variables play an important role. Graham comes to the same conclusion in his paper, “Airport-specific traffic forecast a critical perspective” (Graham 1999).

The interviewees and literature discussed the emerging economies, especially the BRIC, as a major trend. This research focuses on two of these countries specific; India and China. As indicated, Schiphol already has a large share in the Chinese market. The choice for the Indian market is less obvious, whereas Schiphol represents a limited market share within this market in Western Europe. The amount of travellers towards this region is very dependent on demand factors, heavily influenced by airlines strategic decisions. Other regions, like Brazil, might know a larger increase at Schiphol in the coming 30 years.

Interviews

By means of interviews a broad future perspective of the air traffic market as a whole and the position of Schiphol specific are derived. A disadvantage of the semi structured interviews is that opinions of the experts cannot be directly compared with each other. Due to the semi formal structure of the interviews, not all the interviewees had discussed the same topics. The trends as discussed in this project were supported by all interviewees and literature, albeit with a few nuances. The specific uncertainties on the other hand were mentioned in some or just one of the interviews. Multiple times the interviewees had a contrary vision upon each other.

Model

The reflection portraits the model as given in the 0-scenario. In general, models are unable to explain the behavior of a system in detail. In the model a reductive view of the reality is given. Meanwhile
the system boundaries reduce the complexity of the system as a whole. As a consequence some of the behavior in the system cannot be explained by the model.

All the models are very dependent on their input parameters, which are on their selves also based on forecasts. There is just limited research available about how to reduce this input uncertainty, sensitivity analysis is often used (De Jong, Pieters et al. 2005). The regression models for the transfer segment are unable for use on the long term, whereas they show much unexpected behavior. This invokes the question if the OD regression models will be trustworthy as well.

Ageing model

The regression function for the percentage of elderly takes the age distribution in Western Europe and the United States, the Oil price, the share of the low cost segment and the economic performance of Western Europe into account. There are multiple other independent variables next to these, which will impact the share of elderly at Schiphol such as the number of “elderly” destinations, the higher motivation to travel and the better health of elderly that are not taken into account.

The constant in the regression function has a level of significance of .750, which is relatively high. Two other variables also have a significance level that is higher than .05 namely .060 and .079. The constant cannot be excluded separately and the exclusion of the other two variables will decrease the explanatory value. These high significance levels increase the uncertainty in the regression function.

In the ageing model the percentage of elderly (60+) is measured. This percentage is based upon the division in Schiphol’s own continue research, the 60+ boundary had much sense in the past. Due to the improving health conditions of elderly together with the shift in the average age of retirement the division might shift. In the future, there will be more people in the ages between 60 and 70 in better health, still working and travelling for their businesses. These groups require other specific services than the other elderly travellers.

One of the independent variables of the ageing regression function is the low cost share. This low cost share slightly decreased the percentage of elderly in the past. There are many forms of low cost carriers and the impact on elderly for every form will be different. This is not taken into account in the model. At the same time the low cost carriers are, according to the experts, changing their business strategy in a more customer focused strategy. It is assumed that this could decrease the impact of low cost share on the percentage of elderly. Meanwhile, the future elderly will be more accustomed with the low cost segment, which might also decrease the impact of this segment on the share of elderly.

The regression function also indicates that elderly are less price sensitive; this assumption is based upon the past whereas the pensions always increased with the inflation. For the future it is unsure of this trends will continue.

The value for the increase of elderly in the US and Western Europe is almost equal. This is not in accordance with the percentage of US citizens at Schiphol airport

Emerging economies

Two different modeling approaches are used for the emerging economies; a regression analysis and the gravity model.

The regression analysis data is derived from the APG database and converted into a forecast for Schiphol. The regression analyses are conducted over the last 5.5 years. These years include the credit crunch, which can distort the data from the regression function. Also, for the regression analysis monthly numbers are used, while an increase or a decrease in traffic based upon a lower price or low economic growth will have a delay in the effect. Especially during uncertain times this effect can be large. For most of the regression functions the average ticket price is an important predictor for the number of travellers. However the ticket price is hard to take into account on the longer term.
There are two gravity models estimated. The first takes into account the data from the US and the Japanese market. The second takes into account the data from the US, the Japanese, The Canadian and the South American market. Both models are heavily influenced by the US data. The numbers from and to the US are relatively high and therefore have a major impact on the estimation of the Mean Squared Error. Excluding the US market will reduce the explanatory value in many of the models. The other markets represent often a smaller (Canada) or specific (Latin America) market or are heavily influenced by strategic choices by a carrier (Japan). India and China are both considered to have the same potential in business and non-business as the US.

All the gravity models for China and India are compensated with a compensatory value that is based upon the difference between forecast and the real number over the years 2005-2010. This compensatory value explains indicates the difference between supply and demand parameters at an airport that are not inserted into the gravity function. The years include some of the crisis years, during these years heavy fluctuations in oil price occurred. As a result sometimes the year 2009 is excluded from this compensation measure. The determination of the compensatory measure is therefore not thoroughly and should be revised every year.

For emerging markets the propensity to fly of citizens of an emerging country is very dependent on the amount of air traffic. This propensity to fly will rise more above a certain level, as described by Love and Goth et al (Love, Goth et al. 2006). Both models do not take the motivation to travel into account, which weakens the explanatory value of the model. The models also not include the increase of the middle class in emerging economies, which is one of the main contributors to air travel demand.

Both Indian specific models indicate more or less the same behavior over time. This behavior however differs from the forecasts up to 2030 made by Boeing and Airbus. Although Boeing and Airbus forecast data can change heavily in subsequent years, both models might be too optimistically in their forecast.

For the China model specific there is a large discrepancy between the regression model and the gravity model. On the long term the regression model outperforms the gravity model heavily, while the gravity model matches both Airbus and Boeing expectations.

Scenario
The scenarios are based upon the major uncertainties or a combination of uncertainties. Due to the research methods and time constraints, the impact of the uncertainties and the level of uncertainty are not ranked by experts. Instead this is done qualitatively based upon literature and the interviews. For future research an approach with the consult of experts is advised.

Next, there is no single economic downturn scenario in the project, as a short term economic downturn does not affect the long term development of air traffic heavily. Nowadays a long term economic downturn scenario for Europe seems to be more likely than a half year ago. Although the sensitivity analysis indicates the sensitivity upon a long term lower growth, for future scenario studies a long term economic downturn in Europe should be considered.

Overall the scenarios are qualitative well founded, the quantitative parts of the scenario however are very difficult to substantiate. For many of the scenarios it is very uncertain what the quantitative effect will be on the longer term. This is dependent on a number of other variables for each scenario. Together with the sensitivity analysis these scenarios should give bandwidths for the future trends.

Another drawback of this scenario approach is that the scenarios do not integrate trend breaks. All scenarios occur from 2012.

9.2 Reflection on the process
In this project I really enjoyed the combination of different disciplines; specific knowledge about the aviation sector, obtained by interviews and literature review, modeling and scenario analysis. This is in line with the TPM background of combining modeling with more qualitative approaches to solve problems related to the multi actor context.
One of the first difficulties I experienced was the strategic level of the project. Most of the projects during the university were aimed at process improvements or analyzing and solving a problem. The boundaries of the study were not yet set, the only two questions I got were; “who is our future traveller?” “How can we serve its needs?”

Defining the project’s structure appeared to be difficult due to the lack of a real problem and the infinite system. In an early stage I came to the conclusion that I’d better transfer the question of “who is the future traveller” into “what is different between the future traveller and the existing one?”

With this question in my mind I started to do formal interviews with the seven experts in the field of air traffic. These interviews were semi structured, though I wanted the interviews to be very open. I basically asked the interviews about three main themes; the trends in the aviation sector, the uncertainties within and the position of Schiphol. Although, the scope of the interviews was large the interviews gave me good insights in the different directions of this study and help me to define the boundaries of the system.

During the Airneth congress I visited in April I managed to speak with many experts in the field of aviation about my project. Afterwards I managed to narrow my scope of the project and set the system boundaries. I decided also to really use my idea of formal interviews in the qualitative phase of the project.

The interviews held were the perfect location to narrow the system boundaries and meanwhile go more in depth at some of the subjects. Interesting to see were the big differences in perception of the uncertainties. While most of the interviewees had the same opinion about future socio economic trends, many differences in opinion existed among the interviewees about the uncertainties Schiphol will be facing and the effect of these uncertainties. Paul Peeters, for example emphasized the increasing role of aviation in the exposure of greenhouse gasses and stated that unconventional solutions are required to solve these problems. While Frank van der Zwan and Pieter Cornelisse together with Anke Pronk argued that the emission trading scheme could impact air traffic at Schiphol dramatically, Paul’s thought were different. The disagreement between the expert about many of the uncertainties and the role of Schiphol, stressed the size of these uncertainties. A combination of interviews supplemented with literature review finally determined the real system boundaries.

Already during my kick off appeared that answering both questions “who is the future traveller” and “what are its needs” would be too ambitious for one project. A logical consequence was to skip the second question because an answer on the first question was lacking.

The whole process was very iterative. I started with a very wide problem statement including all traffic up to 2025. Next I changed to specific trends, also leaving the uncertainties behind to end with a model of three trends and uncertainties included. During the project divergence and convergence were subsequently used in many different occasions. Air transport is an often discussed topic in literature and in the beginning I got stuck in the amount of literature. After defining the boundaries of the research the literature review also became easier. Also much iteration was necessary before I finally defined my trends and uncertainties and what the real differences between those two were.

The same went for the modeling choice. Because of the prerequisite of a quantitative model and the preferred explanatory value a causal model seemed to be most reasonable option. During this study I frequently doubted between a gravity modeling approach, a system dynamics model and a regression analysis.

Although most interviewees were really open and full of enthusiasm to tell their opinion I experienced some friction in my interview with the KLM. Before the interview, both KLM and Schiphol started argumenting about the new cost structure for landing fees. The impact of this I
experienced in my interview where I had to answer all kinds of question about my research, its objectives and possible outcome.

Retrieving appropriate data was sometimes hard. For example some of the data was on quarterly base and had to be on a monthly base while other data was in local currency and had to be transferred in to USD. Coincident and choices should be eliminated from the data; therefore I used Western European data to estimate my models.
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Appendices
Appendix 1 Abbreviations

ETS = Emission trading scheme
AAS= Amsterdam Airport Schiphol
SG= Schiphol Group
GDP = Gross Domestic Product
ICA= Inter Continental
CAP= Capacity management
ADI= Analysis development and innovation
BA= Business Area
MRI= Marketing Research and intelligence
ASF = aviation statistics and forecasts
PAX= passengers
AF-KLM= Air France- KLM Group
CDG= Charles de Gaulle
O&D= origin & destination
Business Passenger= Passenger in segments business, study and congress
VFR= Visiting family and relatives
NBTC= Netherlands Board of Tourism and Conventions
ICAO= International Civil Aviation Organization
RPK= revenue passenger kilometers
JV= Joint Venture
LCC= Low cost carrier
Appendix 2 Interview questions and list of interviewees formal interview

Mr. P. Cornelisse
Mr. Cornelisse is working as a Director Strategy & Schiphol Projects at Air France- KLM. He has much knowledge in optimizing route structures and airline economics.

Mrs. A. Pronk
Mrs. Pronk is for a long time working in the aviation business. She started at the Schiphol Group and joined the KLM later. She is now Director Airport & Environmental Strategy at Air France- KLM, Schiphol’s biggest customer and main carrier of the Netherlands.

Dr. J.M.G. Heerkens
Policy researcher at the University of Twente School of management in the field of aviation. Nowadays involved in the research of unmanned airplanes. He is also editor of the magazine Piloot & Vliegtuig. Together with other researchers he was invited to comment on the “Luchtaartnota” by the ministry of traffic. Hans Heerkens is often cited in the media as Dutch expert in the air traffic sector.

Mr. K van der Most
Mr. Van der Most has a double function as Manager Research at Netherlands Board of Tourism & Conventions and Director at NBTC-NIPO Research. The double function and his years of experience in the field of tourism gives him many insights in the tourism business. The research done at the NBTC focuses on the inbound and outbound tourism for leisure and business purposes.

Ass Prof. Ing. P. Peeters.
With a background as an aeronautical engineer he worked for many years in the environment and transport sector as a consultant and employee of Milieudienst. Nowadays he is working as an Associate Professor Sustainable Tourism and Transport at the NHTV in Breda. Here he is one of the editors of the carbon footprint for the Dutch tourism sector.

Mr. J. Veldhuis
With a background in economics and econometrics and many years of experience as employee at the Schiphol Group, Central planning institute in the Netherlands and the civil aviation department, he is now working at the SEO research institute. This institute focuses on economic research in the field of the airline industry.

Prof. Dr. J G de Wit
Nowadays working as a Director Netherlands at the Institute for Transport Policy Analysis and also as a Professor of Transport Economics at the University of Amsterdam, Jaap de Wit has an extensive background in the aviation industry.

Dr. Ir. F. M. van der Zwan
Working as an assistant professor in Aviation at the TU Delft, and many years of experience as an employee in public bodies, he did much research in the airline industry.
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<th>Algemeen</th>
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<tr>
<td>Wat is uw achtergrond?</td>
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<td>Wat is uw expertise?</td>
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<tr>
<td>Trends en Ontwikkelingen</td>
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<tr>
<td>Welke trends verwacht u in de komende 15 jaren en hierna die een invloed zullen hebben op de passagiers in de luchtvaartsector?</td>
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<td>Wat zijn de achterliggende factoren achter deze trends?</td>
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<td>Hoe veranderen deze factoren over tijd?</td>
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<td>Welke factoren hebben een grote invloed en welke minder (elasticiteiten)?</td>
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<td>Op welk niveau vinden deze trends en ontwikkelingen plaats (landelijk, continentaal, intercontinentaal)?</td>
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<td>Wat is de termijn waarop deze trends zullen plaatsvinden?</td>
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<td>Hoe groot is de impact van deze trends op de luchtvaart?</td>
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<td>Hoe verhouden deze trends zich in tijdstermijn en impact van elkaar?</td>
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<td>Welke passagierstypen zullen in aantallen of eigenschappen verschillend zijn van de huidige passagierstypen?</td>
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<td>Positie Schiphol en Nederland</td>
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<td>Wat is de positie van Schiphol in deze trends?</td>
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<td>Wat zijn de sterke punten van Schiphol tov deze trends?</td>
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<td>Wat zijn zwaktes van Schiphol tov deze trends?</td>
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<td>Welke kansen liggen er voor Schiphol betreffende deze trends en ontwikkelingen?</td>
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<td>Welke bedreigingen zijn er voor Schiphol?</td>
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<td>Hoe is de positie van Schiphol/ Nederland tov andere vliegvelden en landen in deze trends en ontwikkelingen?</td>
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<td>Wat is de positie van Europa op het gebied van deze trends?</td>
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<td>Onzekerheden</td>
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<td>Hoe zeker is het dat deze trends zich in de toekomst zullen ontwikkelen?</td>
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<td>Hoe verhouden zich het effect van de trends en de zekerheid dat deze trends gebeuren zich tov elkaar? (assenstelsel)</td>
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<td>Welke onzekerheden spelen een rol bij deze trends?</td>
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<td>Wat zijn de grootste onzekerheden?</td>
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<td>Hoe groot is de invloed van deze onzekerheden?</td>
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<td>Welke factoren zijn van invloed op deze onzekerheden?</td>
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<td>Hoe veranderen deze factoren over tijd?</td>
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<td>Oplossingen</td>
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<td>Welke stappen zou Schiphol moeten ondernemen om deze trends voor te zijn?</td>
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<td>Op welk terplijn zouden deze stappen moeten worden genomen?</td>
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<td>Algemeen</td>
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<tr>
<td>Wilt u verder nog iets kwijt?</td>
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<tr>
<td>Zijn er nog andere personen die ik zou moeten spreken?</td>
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Appendix 3 Formal Interviews

Interview Anke Pronk en Pieter Cornelisse KLM Hoofdkantoor Amstelveen 16 Mei

Algemeen
Gemiddeld is 30% van de passagiers afkomstig van de lokale markt, hiervan komt naar schatting 40% uit het buitenland en ongeveer 60% uit Nederland. De overige passagiers zijn transfer passagiers. De kwetsbaarheid bij transferpassagiers ligt eraan dat de opbrengsten over twee vluchten moeten worden verdeeld terwijl er in dit marktsegment vooral geconcurreerd moet worden op prijs met andere luchtvaartmaatschappijen.

Propensity to fly van Nederlander lager dan bijvoorbeeld Duitser of een UK waar deze historisch hoger ligt.

Het netwerk van het Skyteam bestaat uit ca 78 Europese bestemmingen vanaf Schiphol. Daarnaast verbindt zij vanaf Schiphol op de Noord Atlantische routes 20 bestemmingen met elkaar waartussen dagelijks 38 diensten worden gevlogen.

Trends
De opkomst van de BRIC landen is een trend die zich nog verder zal gaan ontwikkelen. Op dit moment is de KLM in greater China (hiertoe behoren ook Taiwan en Hong Kong) de grootste Europese speler in termen van aantal bestemmingen.
De BRIC landen zijn slechts toegankelijk als er landingsrechten verkregen worden. Grotere landen krijgen veelal meer voor elkaar wat betreft overeenkomsten, landen zoals Frankrijk, Groot-Brittannië en Duitsland. Gelukkig is Nederland een goede onderhandelaar.

Azië
Er is een verschil tussen de routes naar China en Noord Atlantische routes. Qua groei aantallen zullen de stromen naar China percentueel gezien hard groeien. Echter de aantallen in absolute zin zullen toch nog beperkt zijn vooral in vergelijking met de Noord Amerikaanse markt. Door de in totaal 280 miljoen Amerikanen wordt namelijk veel meer gevlogen dan in China.
Slechts een heel klein gedeelte van de in totaal 1,3 miljard Chinezen zal als leisure verkeer intercontinentaal vliegen. Op dit moment zijn er vanuit China 30 tot 40 miljoen ICA zakelijke reizigers (middenklasse). Dit is een verdubbeling van 10 jaar geleden en dit zal weer verdubbelen. Echter de Chinezen zullen nooit allemaal gaan vliegen. Het grootste gedeelte van de Chinese vliegreizen vindt plaats binnen China.

Een ander land in opkomst is Indonesië. Echter de bevolking in Indonesië is erg arm en de KLM heeft op dit moment al een redelijk goed netwerk met Jakarta en Bali. Met de toetreding van Garuda tot het Skyteam is Australië straks ook beter bereikbaar!

De KLM heeft een wat minder breed netwerk richting India. Deze markt luchtvaartpolitiek nog beperkt toegankelijk. Deze markt wordt momenteel uitvoerig bediend door Emirates die via haar hub in Dubai de Europese steden met India verbindt.

Zuid Amerika
Ook Zuid Amerika is voor KLM een focusgebied. Een voorbeeld hiervan is de heropening per Winter 2011 van de diensten naar Buenos Aires. Extra bestemmingen in dit werelddeel vragen om solide lokale samenwerkingspartners op welke ‘gefeederd’ kan worden.

Afrika

Onzekerheden
Infrastructuur in Europa voor luchtvaart is beperkt. Met de huidige groeiontwikkelingen ontstaan er indire toekomst zowel in de lucht als op de vliegvelden capaciteitsproblemen. Dit kan een negatief effect hebben op de puntualiteit van het vliegverkeer. Met Single European Skies (SES) wordt toenemende congestie in het Europese luchtruim zoveel mogelijk beperkt. De capaciteit in het luchtruim rondom Schiphol (de zgn TMA) wordt momenteel nog voor een groot deel door de menselijke factor bepaald.

Het Emission Trading Scheme (ETS) zou moeten gelden voor alle airlines om te voorkomen dat het level playing field wordt verstoord. De impact hiervan is onzeker. De vorm hoe ETS wordt geïmplementeerd is hier bepalend voor.

Er zou gestreefd moeten worden naar een Level playing field voor alle airlines. Er zijn tal van voorbeelden waardoor dit level playing field verstoord wordt. Enkele voorbeelden zijn: de destijds ingevoerde tickettax op OD verkeer waar alle airlines en ook de luchthaven veel terugslag van gekregen hebben en de vele (kosten) voordelen die golf carriers hebben.

Positie Schiphol
Op het leeuwendeel van de 80 grootste Nederlandse longhaul markten biedt KLM met haar partners een rechtstreekse vlucht aan.

Een van de doelen van de KLM is om de netwerken aan haar thuisbasis op Schiphol te verbinden. Daarnaast is het van belang de O&D markt te bedienen. Gemiddeld zitten er ongeveer 30% O&D passagiers op de vlucht. Dit verschilt echter per markt. Voor grotere markten zoals Zuid Afrika en New York is er voldoende vraag vanuit de O&D markt, andere bestemmingen moeten echter vooral gevoed worden met transfer passagiers.

Het transfersegment is bijzonder kwetsbaar. Dit type passagier heeft namelijk altijd de keuze uit meerdere maatschappijen en meerdere gateways.

De landelijke bereikbaarheid is voor Schiphol van groot belang om voldoende thuismarkt te blijven vasthouden. Hierbij speelt vooral de OV-bereikbaarheid een belangrijke rol.
De opkomst van het golfgebied blijft een grote bedreiging. Golfcarriers hebben 90% transfer passagiers aan boord en verbinden vooral de lucrative stromen tussen USA/Canada en Europa met Azië, Afrika en Oceanië.
Interview Hans Heerkens Universiteit Twente Enschede 26 Mei

Trends
Opkomst van Azië, vooral veroorzaakt door economische groei en de groei van de midden klasse. Hierbij is China voornamelijk van belang omdat het land een grote massa heeft. Maar ook andere landen zoals Maleisië zullen belangrijker worden in de luchtvaart.

De groei van de steden en de groei van internationale handel draagt bij aan de groei van de luchtvaart. De grootte van de steden in China en de verregaande verstedelijking maakt het mogelijk om point to point verbindingen te hebben met deze steden. Boeing anticipeert hierop met bijvoorbeeld de Dreamliner. Echter het hub en spoke netwerk zal nog steeds blijven bestaan. De Dreamliner is voor zijn formaat efficiënt, echter zullen grotere vliegtuigen altijd efficiënter blijven als hier weer de nieuwste technologie wordt toegepast. Voor China geldt overigens dat de steden ver uit elkaar liggen, dit verhoogt de complexiteit voor het opereren in een hub en spoke configuratie. De point to point verbindingen zullen vooral groeien door verbindingen naar nieuwe steden in het netwerk. De overige groei zal met name buiten de piek uren om vliegen.

De verhouding tussen hub and spoke verkeer en point to point wordt steeds voordeliger ten gunste van het point to point verkeer. Door de verstedelijking ontstaan er grotere potentiële markten. Tegelijkertijd worden kleinere vliegtuigen steeds kosten effectiever op de lange afstand. Hiernaast is er een toenamen in de grote van vliegtuigen zichtbaar. De nieuwe 737 wordt bijvoorbeeld waarschijnlijk een maatje groter.

Point to point carriers hebben in tegenstelling tot de netwerkcarriers de mogelijkheid om verbindingen flexibel in te zetten. Zo opereert Ryanair voor Poolse werknemers die naar Engeland willen vliegen. Relatief gezien is er een toenamen van het point to point verkeer dit biedt een kans voor Schiphol.

Vliegen is te goedkoop als we de gevolgen hiervan beschouwen. De capaciteit op luchthaven is klein waardoor er lange vertragingen ontstaan en mensen in wachtrijen moeten wachten omdat 17jarige jongeren willen vliegen. Ook wat betreft milieuvorstelling is vliegen te goedkoop. Echter hierbij is de vraag of diegenen die nu niet meer vliegen niet iets anders gaan doen voor dit geld wat nog milieuvorstelling kan werken.

Oplossingen
Met een prijsmechanisme zouden zakenreizigers bevoorwoorde moeten worden
Low cost carriers verbannen naar andere vliegvelden

Zakelijk en niet zakelijk zit in hetzelfde vliegtuig terwijl de capaciteit niet toereikend is op de vliegvelden en in het luchtruim, hierdoor ontstaan er onnodige vertragingen. Als de grens is bereikt moet recreatief eerst de klos zijn.


Meer fusies en overnames
Technologische trends en ontwikkelingen binnen de Europese Unie zijn de ontwikkelingen van very light jets. Onbemande vracht vliegtuigen.

Een andere ontwikkeling is de samenwerking tussen lowcost airlines en netwerk maatschappijen. Vooral op routes waar veel wordt gevolgen is dit mogelijk. Hier hoeft immers geen rekening gehouden te worden met aansluittijden. Hiervoor is het van belang dat de ticketverkoop transparanter wordt en dat de passagier via 1 ticket kan boeken voor de gehele vlucht, of dit bij een partij af kunnen nemen. Het meest waarschijnlijke is om dit te doen via een website. Hier ligt voor Schiphol een uitdaging. Als een van de weinige Europese primaire luchthavens heeft Schiphol zowel low cost carriers als netwerk carriers. Hiernaast is de vraag hoe dit infrastructureel geregeld is en wie hiervoor gaat betalen..

De vergrijzing is een belangrijke trend die veel invloed kan gaan hebben in de toekomst. Enkele voorbeelden hiervan zijn; er zijn nauwelijks zitplaatsen bij de gate, informatie technologie dient erg gebruikersvriendelijk te zijn en men komt niet naar Schiphol omdat het reizen via Schiphol als eng wordt ervaren, doordat de grootte van Schiphol intimiderend werkt en men bijvoorbeeld niet weet waar zij de auto moeten parkeren

Positie Schiphol

Van oudsher heeft Schiphol al een goede geografische positie, aan de rand van Europa. Trans-Atlantische luchtvartrechten werden op een slimme manier verkregen. Echter met de open skies verandering en de alliantievorming is er een grotere markt ontstaan waardoor de positie van Schiphol is verslechterd.

Schiphol heeft geen sterke positie omdat ze geen structurele voordelen heeft tov andere luchthavens, maar dit is wel afhankelijk van de ambitie van Schiphol.

Voor Schiphol is het eigen verzorgingsgebied erg van belang. Schiphol moet zich meer richten op wat voor de BV Nederland van belang is. Het is de luchthaven van een belangrijke stad. Schiphol moet vluchten vullen die direct voor het verzorgingsgebied en voor de economische activiteit in Nederland van belang zijn.

De sleutel tot succes is de kwaliteit en de omvang van het verzorgingsgebied. Een consequentie hiervan zou zijn dat er een minder groot netwerk moet worden aangeboden. Het dient een goede mix te zijn van hub en spoke verbindingen en point to point.

Daarnaast is het goed om actief in te spelen als er de-hubben plaats gaat vinden. Enkele Amerikaanse vliegvelden hebben hier goede strategieën voor gevonden.

In de nota voor de luchtvaart wordt de ontwikkeling van Schiphol tot internationale luchthaven beschreven. Deze nota heeft veel invloeden van de KLM in zich. Hierin komt namelijk naar boven dat wat goed voor de KLM is goed voor de BV Nederland is.

De kwaliteit van Schiphol wordt hierbij gemeten aan het aantal verbindingen terwijl de bereikbaarheid hier een minder grote rol speelt.

Een uitzondering op deze strategie is Dubai. Voor Dubai is het essentieel om zich te ontwikkelen voor als de olievoorraden gestopt zijn. Door middel van de luchtvaart heeft zij er voor gezorgd dat er grote passagiersstromen via het land reizen. Hieruit kunnen zij toeristen genereren die naar de toeristische locaties komen die gecreëerd worden.

Een potentiële gevaar is dat Schiphol teveel gefocust is op andere zaken zoals vastgoed ontwikkeling en de ontwikkeling van andere luchthavens en zou zich meer moeten focussen op haar core business.
Groep reizigers die kijken waar ze heen kunnen vliegen bijvoorbeeld vanaf vliegveld Twente ipv alle rompslomp op Schiphol.

Onzekerheid
Brandstof tekort is een zekerheid.

Dreamliner voor zijn formaat uiterst efficiënt, echter met de nieuwste technologieën zullen grotere vliegtuigen altijd een voordeel behouden over kleinere vliegtuigen.

Overgang duurzaamheid; deze transitie zal sneller gaan als de olieprijs hoog is.

Reageren op capaciteitstekort; de luchtvaart groeit sterker dan de capaciteit (Europa)
Het inspelen op de capaciteit is een grote uitdaging, in Amerika hebben ze deze meer onder de controle dan in Europa. Airlines kunnen hierdoor winstgevender worden. In 2008 werd er door Amerikaanse maatschappijen een grote verhoging van de olieprijs verwacht die uiteindelijk zou leiden tot een verlaging van het aantal passagiers. Hier werd door de maatschappijen op geanticipeerd door de capaciteit te verlagen, hierdoor waren zij goed voorbereid voor de crisis. Het is een zwakheid dat er geen rem op de capaciteit zit. De vermindering van capaciteit op de Noord Atlantische corridor van KLM-Air France en Delta is een ander voorbeeld van het beïnvloeden van de capaciteit om meer winstgevend te worden.

Route netwerk Air France KLM; dit is historisch gegroeid een single hub airline met als basis Parijs levert veel synergie voordelen op. Echter er zijn ook nadelen aan een single hub zoals een verlies van het verzorgingsgebied en een gebrek aan capaciteit op de hub.

Fragmentatie; A350 en de 787 Dreamliner

Liberalisering van Azië; zowel intern als extern; op welke wijze verloopt de liberalisering in Azië en wat betekent dit voor Europese airlines.

ETS. Afhankelijk van de lengte van de spokes en het belang hub. Totale kosten stijgen al als olieverbruik stijgt. De luchtvaart dient ook een bijdrage te leveren aan de CO2 reductie.
Interview Kees van der Most NBTC Leidschendam 10 Juni

Trends
Het inkomende toerisme zal de komende jaren een grote groei kennen. Zowel het zakelijk als het niet zakelijke segment zullen groeien, waarbij de groei van het niet zakelijke segment waarschijnlijk het grootste is. De groei van de economie speelt bij de toename van beide segmenten een belangrijke rol. Voor het zakelijke segment geldt dat de toename van innovatieve manieren om samen te werken de groei kan beïnvloeden.

Binnen Europa zal vooral de korte vakantie markt een grote groei kennen. Dit wordt veroorzaakt door de welvaartstijging.

Het binnenlands toerisme kent een stabilisatie, hierbij zijn vooral stedentrip in trek. Het uitgaande toerisme kent daarentegen wel een groei.

Een grote toename wordt voornamelijk verwacht vanuit de BRIC landen. Vooral China en Rusland zijn groeimarkten. Wat betreft inkomend toerisme zal China niet de VS gaan inhalen in aantallen. Naar verwachting zal China in 2020 het 8ste land zijn met tussen de 400.000 en 500.000 toeristen die Nederland bezoeken per jaar.

Het senioren segment binnen het toerisme is stijgende. Deze stijging is binnen de gehele Westerse wereld zichtbaar, maar ook in de VS en landen zoals Japan. Nederlandse senioren maken bovengemiddeld veel vakanties. Het aanbod van bestemmingen van de senioren reiziger is erg breed. De producten zoals geleverd door Easyjet en Ryanair sluiten minder goed aan bij de senioren markt.

Verdere digitalisering zal tot veranderingen leiden in de toeristische industrie. Tegenwoordig is er al duidelijk een effect zichtbaar van het boeken en zoeken via het internet. De aanwezigheid van mobiel internet en social media zal in de toekomst veel belangrijker gaan worden.

In het uitgaand toerisme is er een trend zichtbaar dat veel Nederlanders naar regionale luchthavens zijn uitgeweken. Dit is echter niet het geval voor inkomend toerisme, hier komt ongeveer 95% nog steeds via Schiphol.

Duurzaamheid in vakanties is op dit moment nog geen issue maar naar verwachting zal dit aandeel groter worden. Echter er is wel een kentering waarneembaar. Het is tegenwoordig minder geaccepteerd om voor een weekendje shoppen het vliegtuig te nemen of om naar Dubai te gaan om daar te gaan skiën in een skihal.

Aziaten die op dit moment naar Europa komen doen dit vaak voor een trip door geheel Europa. Hetzelfde gebeurde er 40 jaar geleden met de Amerikanen. Echter tegenwoordig kiezen Amerikanen veel meer om slechts een of twee bestemmingen grondig te bezoeken.

Positie Schiphol
Op dit moment is Schiphol een goede luchthaven. Er is groei en er zijn voldoende verbindingen. Uit toeristisch oogpunt is er bezorgdheid over de uitplaatsing van vluchten. De aanwezigheid van low cost carriers dichtbij Amsterdam geeft immers een boost aan het toerisme. Vanuit toeristisch oogpunt zou een verplaatsing van het low cost verkeer van Schiphol vandaan veel nadelige gevolgen hebben.

Voor Nederland als toeristische locatie zijn de 4b’s van belang:
Bereikbaarheid; hierbij gaat het om het gemak om een visum aan te vragen, de verbindingen vanaf Schiphol en de ontwikkeling van de mobiliteit op de weg.
Beschikbaarheid; bijvoorbeeld voldoende hotel capaciteit
Bekendheid; Nederland positioneren in het buitenland, niet de naamsbekendheid als Londen en Parijs

Onzekerheden
De economie is de grootste onzekerheid.

Verder nog incidenten zoals de aswolk, epidemieën of het terrorisme. Echter hebben deze incidenten een slechts tijdelijke invloed op het toerisme. Na Madrid zakte het toerisme even in maar hierna is het snel toegenomen.
Vanuit een toeristisch oogpunt zijn de kosten van het vliegen erg belangrijk. Deze worden bepaald door o.a. de olieprijs maar ook een emission trading scheme kan hierop van invloed zijn. Hierbij is het afhankelijk van de hoogte van het bedrag.
Interview Paul Peeters Ede Wageningen 12 Mei

Algemeen
Als er over toerisme gesproken wordt zijn er altijd verschillende definities van toerisme voor handen: iemand die op vakantie gaat iemand die reist

De UNWTO definitie: iemand die, langer dan 1 nacht, buiten zijn omgeving verblijft. Hiertoe kunnen onder andere zakenmensen, VFR (visiting family and friends) en congres en evenementen bezoekers behoren.

De toeristische verdeling tussen binnenlands en buitenlands toerisme is in veel gevallen een zinloos onderscheid; een verdeling naar afstandsklassen was aanzienlijk beter geweest.

Bij het CBS zijn veel cijfers over het toerisme bekend. In Europa lijkt het toerisme groot. Het internationale toerisme is in Europa ongeveer 20%. Dit geeft echter wel een vertekend beeld omdat de omvang van heel Europa overeenkomt met de omvang van de gehele VS.

In andere gebieden zoals China is de totale binnenlandse toeristische markt nog steeds goed voor 95%.

Het CBS geeft aan dat er jaarlijks vanuit Nederland ongeveer 30 miljoen toeristische trips worden gemaakt. Dit is exclusief zaken maar het zijn niet pure vakantiegangers. Een gedeelte hiervan bezoekt vrienden, familie of relaties.

Voor Nederland geldt dat ongeveer 50% is binnenlands toerisme en 50% is internationaal.

Er zijn grote onderlinge verschillen tussen verschillende reizigers. Zo is er een substantieel aantal reizigers dat per jaar 10 tot 20 keer of meer vliegt. In Nederland is er ook een groep mensen tussen de 30% tot 40% die niet vliegt.

Trends
Er is een constante groei te zien in het totale aantal gemaakte vliegreizen.

In de wereld geldt dat 4% van de mensen regelmatig vliegt, dit percentage zal stijgen. Naar verwachting is er nog steeds een groep van 30% tot 40% van de mensen die niet vliegt. Er is eveneens een groot percentage mensen dat slechts 1 reis maakt.

Er wordt door de Nederlandse toerist korter en vaker gereisd. Dit wordt gestuurd doordat de beschikbare tijd hetzelfde is gebleven maar de mogelijkheden met het beschikbare budget zijn vergroot.

Het aantal ouderen in Nederland die vliegen stijgt substantieel, de babyboom generatie, het gebrek aan tijd gedurende hun leven en de ongekende welvaart die zij hebben gekend zorgt ervoor dat dit percentage stijgt. Een andere bijdragen factor hieraan is het feit dat deze generaties zeer beperkt reisden en nu een ‘inhaalslag’ maken. Deze ouderen maken vooral veel verre reizen.

In zijn totaliteit kan gesteld worden dat het gedrag van de reiziger verandert door kosten en reistijd. In het vervoersysteem wordt er eveneens van uit gegaan dat er een constante verhouding bestaat tussen reistijd en reisduur. Als de reistijd korter is dan is het mogelijk om korter te blijven.

Het international toerisme stijgt harder dan het binnenlandse toerisme.
Afstandsvergroting van de vliegreizen met 5% tot 6% per jaar. Omdat men de gelegenheid heeft (tijd en geld), verandert het verplaatsingsgedrag.

Ook de andere BRIC landen groeien hard. Echter over Rusland zijn weinig statistieken voor handen.

Een andere waarneembare trend is de verschuiving van kwaliteit in het vliegtuig

De toerisme industrie als geheel kent geen tot weinig groei. Er is een verschuiving zichtbaar mede in de kosten van vliegen.

Onzekerheden
Er is een grens aan de ongeremde groei. Deze grens wordt veroorzaakt door klimaatverandering. De CO2 uitstoot van toerisme vormt een groot probleem en dit zal in de toekomst alleen nog maar toenemen. Op dit moment is het aandeel in de totale uitstoot van toerisme reeds 5%, dit aandeel zal in de toekomst exponentieel stijgen en hierin is de nieuwe technologie eveneens meegenomen. Om dit percentage weer naar beneden te krijgen zullen de afstanden drastisch moeten worden verminderd. Hiervan is het hoger beprijzen slechts een manier.

Het ETS (emission trading scheme) kan hierop alleen van invloed zijn als de prijs naar ver boven de 1000 Euro per ton CO2 kan gaan, ipv van de huidige 15-25 Euro.

Andere maatregelen zouden zijn de capaciteit beperken. Door het creëren van schaarste gaan de prijzen vanzelf omhoog. Dit zou nog wel eens een goede uitkomst voor de sector kunnen zijn, immers deze is al jaren verliesgevend, terwijl schaarste de prijs opdrijft bij min of meer gelijke kosten. Echter dit zou mondial moeten gebeuren. Toerisme is ook gevoelig voor klimaatverandering en dat maakt het de grootste onzekerheid naar de toekomst toe voor deze sector (olie prijs en carbon costs). Over de gehele sector is toerisme ongevoelig voor klimaatverandering maar lokaal kan er een groot verschil zijn. Het zijn veelal politieke maatregelen die de ongeremde groei moeten beteugelen. Vaak wordt gezegd dat dit ten koste gaat van de derde wereld echter dit is niet het geval. Ook daar wonen rijkere mensen die het geld daar zullen uitgeven. Echter deze zullen het geld aan andere zaken uitgeven.

De politiek zal nu moeten inzetten op een krimp scenario, immers 2030 is een point of no return voor wat betreft een sterke emissiereductie; daarna is die praktisch niet meer mogelijk omdat dan al teveel CO2 in de atmosfeer zit en het er weer uithalen niet praktisch mogelijk is.
Alle commoties rondom klimaatverandering hebben ertoe geleid dat er veel aandacht is gekomen voor het duurzame karakter binnen de vliegindustrie. Op de lange duur moet de KLM echter uitkijken met haar groene imago in de communicatie naar de klanten. Er kan een geitenwollen sokken imago aan kleven, men denkt dat het duur is en het kan uiteindelijk KLM minder aantrekkelijk maken, speciaal geldt dit Nederlandse reizigers; Duits zijn wel gevoelig voor milieugericht. Daarnaast blijkt biofuel, waar KLM nogal op mikt, grotere andere problemen te hebben die ten kosten gaan van bijvoorbeeld goede landbouwgrond, de teelt van biobrandstoffen is erg ruimte intensief en er zijn veel nutriënten nodig. Negatieve publiciteit hieromheen komt langzaam naar buiten den vormt een afbreukrisico.

Een andere onzekerheid voor de luchtvaart is de ontwikkeling van het HSL netwerk. Dit netwerk wordt langzaam uitgebreid en heeft er bijvoorbeeld voor gezorgd dat een groot gedeelte van het verkeer tussen Madrid en Barcelona vervangen is.

Peak oil is een andere belangrijke onzekerheid naar de toekomst. Dit zal een groot probleem worden vooral op de intercontinentale vluchten. Het is de vraag in hoeverre de luchtvaartindustrie het gaat redden om de voldoende energie te verkrijgen.

Positie Schiphol
Schiphol heeft als zwakte dat het als 1 van de 4 hubs een minder groot achterland heeft. Het initiatief van de Deutsche Bahn voor een HSL lijn direct naar Londen dient ondersteund te worden evenals de HSL Oost. Daarmee kan Schiphol ook een internationaal railknooppunt worden. Uitsluitend unimodaal (lucht) blijven denken heeft minder toekomst. De toekomstige mainport zou nog meer de verschillende modaliteiten moeten verbinden met elkaar.

Overig
WTTC (World Travel and Tourism Council) economiemodel
Interview Jan Veldhuis SEO Aviation Amsterdam 6 June

Trends
De groei die er het afgelopen decennium is geweest zal zich naar alle waarschijnlijkheid doorzetten. Deze groei wordt voornamelijk gerealiseerd buiten Europa maar ook binnen Europa zal er een groei zijn. Haperingen zullen hier een remmend effect op hebben maar op lange termijn zal er groei plaatsvinden.

De prijs vechters hebben de groei de afgelopen jaren ontzettend gestimuleerd. Deze groei is daardoor niet zo zeer op Schiphol gefocust maar meer op regionale vliegvelden zoals Eindhoven. Dit geldt voor alle hub vliegvelden in Europa. De grote groei komt van kleinere vliegvelden die andere segmenten bedienen.


De grote groei binnen Europa komt van het voormalig Oostblok, de Baltische staten en Polen. Buiten Europa wordt de groei veroorzaakt door de zogenoemde BRIC landen. Hierbij lopen India en China voorop. Andere snel groeiende regio’s zijn Turkije en de Golf. China en India hebben allebei eigen karakteristieken, zo is China erg gefocust op de industrie terwijl India veel meer een dienstensector heeft. Er is een enorm potentieel in deze markten; de groei kan immers in principe doorgaan totdat zij even veel zullen vliegen als dat wij dit doen.

De gemiddelde Europeaan vliegt 1 keer per 3 jaar. Stel dat de Europeaan 1 keer in de 15 tot 20 jaar buiten Europa vliegt. Als de Chinees dit ook zou doen dan betekent dit dat er jaarlijks 50 miljoen Chinezen buiten China vliegen. Een enorm potentieel. En hetzelfde kan opgaan voor India.

Vergelijkend met de trans-Atlantische stroom valt te verwachten dat deze in de loop der tijd te evenaren valt door de stroom uit China en India. Immers in de VS wonen ongeveer een kwart miljard mensen en als de bevolking van China en India ook maar een kwart zo vaak vliegt als die van de VS is deze stroom al gelijk.

Het effect van de vergrijzing is twijfelachtig. Enerzijds hebben ouderen meer vrije tijd, anderzijds zijn jongeren meer gewend aan vliegen.

Een andere trend is de daling van de prijzen. Vooral het aandeel goedkope tickets zal stijgen. De bodem van de ticketprijzen is bereikt, echter bij netwerk carriers zal het aandeel laag geprijsde tickets toenemen. Netwerk carriers nemen ook steeds meer mechanismen over van de low cost carriers. Long haul is een prijsdaling ingewikkelder omdat veel van de voordelen van low cost airlines op de langere afstanden teniet worden gedaan. Hier moet ook het geld worden verdiend voor de netwerk maatschappijen.

De belangrijkste concurrentie zal plaatsvinden binnen het business concept, dus tussen netwerkcarriers onderling of tussen low cost carriers onderling. Zo blijft het verschil tussen point to point carriers en netwerk carriers behouden.

Positie Schiphol en Nederland
Schiphol heeft te kampen met het dilemma of het zich moet richten op low cost carriers of op de KLM. Voor beiden zijn voor en nadelen. Richten op low cost carriers kan leiden tot kannibalisatie van feeder verbindingen van de KLM. Echter de KLM kan zich op de lange termijn verplaatsen naar Parijs waardoor er op het verkeerde paard wordt gewed. Op dit moment is er nog geen aanleiding om te denken dat de KLM dit zou doen. Ten tijde van de fusie was afgesproken dat beide hubs zich evenwichtig zouden ontwikkelen. Echter, een grootschalige verplaatsing naar Parijs zou alleen kunnen gebeuren als Parijs onbeperkte capaciteit zou hebben, wat op dit moment niet het geval is.

Dit heeft zich echter wel voorgedaan binnen de Star Alliantie waarin veel intercontinentale vluchten van SAS tegenwoordig via Frankfurt verlopen. Er is bijna geen ICA vlucht meer vanuit Kopenhagen.
Een sterke eigenschap van Schiphol is dat het een goede luchthaven is met veel capaciteit. De beperktheid van de thuismarkt valt mee: die van Frankfurt is ongeveer even groot. Hiernaast is het gebeid rondom Schiphol relatief dichtbevolkt, echter is niet alles geconcentreerd in een stad. Er zijn ook goede verbindingen met West Duitsland. De landzijdige verbindingen zijn hierbij erg van belang. Een risico voor Schiphol is de ontwikkeling van kleinere luchthavens in het achterland die een gedeelte van de markt van Schiphol overnemen. Vooral deze kleinere luchthavens zijn de afgelopen tijd erg gegroeid in omvang.

Voor de KLM is het uitgesloten om niet te focussen op Europa, zij heeft immers voeding nodig voor het ICA netwerk.

Hub bypassing is zowel een bedreiging als een kans. Met de dreamliner is het mogelijk om Europese bestemmingen vanuit de VS direct aan te vliegen met een kleinere capaciteit. Echter omgekeerd geldt hetzelfde. De aanwezigheid van A380’s in de vloot van veel grote carriers laat ook zien dat er veel vraag is naar verbindingen tussen de hub airports. Het palet van verschillende vliegtuigen wordt groter dan deze al was.

Beperkingen die voor Schiphol worden opgelegd, betreffende de capaciteit, kunnen een bedreiging vormen voor de toekomst.

De KLM heeft vanuit Schiphol een specialisatie op Oost Afrika en het Verre Oosten. Grote bestemmingen zijn overlappend met Air France. KLM heeft traditioneel een sterke positie in Noord West Europa en richt zich vooral op de kleinere bestemmingen. Beter een groot aandeel in veel kleine markten dan een klein aandeel in een grote markt.

Onzekerheden

Afbrokkeling van de Europese integratie en economie kan ertoe leiden dat er een afname zal plaatsvinden in het vliegverkeer (Griekenland).

Onvoorziene omstandigheden, bijvoorbeeld vulkaan, Japan.

De olieprijs zal stijgen en dit kan nog wel een tijd doorgaan. Op dit moment zijn de brandstof kosten 20% van het totaal. Bij een verdubbeling van deze kosten betekent dit dat de brandstofkosten nog “slechts” 40% beslaan van de totale kosten. Dit zal een kleine verhoging in prijs tot gevolg hebben.

Milieu beperkingen kunnen een remmend effect hebben op de groei van de luchtvaart. Een voorbeeld van een maatregel is de invoering van het Emission Trading Scheme. Dergelijke maatregelen creëren schaarste en kunnen een plafond stellen aan de hoeveelheid vliegbewegingen. Een mondiaal akkoord over het ETS is overigens zeer onzeker.

Op de luchtvaart valt nauwelijks te besparen wat betreft CO2 uitstoot. Er is nog geen vervanging voor kerosine en biobrandstoffen helpen slechts gedeeltelijk. Maatschappijen kunnen rechten inkopen bij andere industrieën.

Midden Oosten Carriers verstoren het level playing field doordat zij mogelijk staatssteun krijgen en onder de prijs van Europese carriers kunnen vliegen.

Liberalisering van het wereld luchtruim; ideale wereld open sky (oude bedrijfstak).
Interview Jaap de Wit KIM Den Haag 10 Mei

Trends
De markt voor passagiers wordt in sterke mate gestuurd door vraag en aanbodfactoren:
Aan de vraag kant wordt deze in belangrijke mate beïnvloed door het besteedbare inkomen (leisure verkeer) en de handel (zaken verkeer).
Factoren aan de aanbodkant zijn onder andere een verdere daling van de prijs van het ticket, de beschikbaarheid van traffic rights (niet van belang in Europa) de bestemmingen en frequenties.

Voor de passagiersgroei in de toekomst bestaat een nauwe relatie met de landen waarmee Schiphol verbonden is, vormgegeven door billaterale verdragen en door het netwerk van de KLM

Luchtvaartpolitiek doormiddel van bijvoorbeeld allianties beïnvloedt eveneens de vraag

Het opereren van de markt kan gekenmerkt worden door een zwaartekrachtmodel

De tarievenstructuur is een van de stuurvariabelen voor Schiphol om een bepaald resultaat te bereiken.

Low cost carriers
Een belangrijke trend is de verdere ontwikkeling van low cost carriers

Kan zowel gezien worden als een kans als een bedreiging maar wordt te vaak gezien als een bedreiging.

South West effect: de introductie van low cost airlines leidt tot een groeiende vraag.

Voor airlines zijn er verschillende scenario’s denkbaar een low cost airline vanaf een hub airport kan een directe concurrent zijn, semi-parallel opereren aan de airline of volwaardig parallel.
Hiernaast kan het tot kannibalisatie leiden waarbij het tot vervanging van het totale product zal leiden.

Een voorbeeld van gedeeltelijke kannibalisatie vormen de vluchten van Ryanair naar Ciampino Rome die een direct effect hebben op de vluchten van de KLM naar Fiumicino.

Een mogelijk kannibalisatie effect waarbij de low cost carriers een vervanging zijn voor de feeders van hub and spoke maatschappijen, is waarschijnlijk.

In de toekomst zal er mogelijk synergie optreden tussen low cost maatschappijen en de maatschappijen die de internationale verbindingen in stand houden. Er blijkt immers telkens maar weer dat het de reiziger niet uit maakt om een low cost airline als feeder te gebruiken voor een long haul vlucht, bijvoorbeeld Vueling en Iberia. Samenwerking tussen low cost airlines en hubcarriers is daardoor niet uitgesloten. Deze low cost carriers weten immers hoe ze tegen geringe kosten klanten kunnen vervoeren.

Deze mogelijkheid ligt meer voor de hand bij Frankfurt en Amsterdam omdat de carriers op deze luchthavens in grotere mate afhankelijk zijn van hun feeders.

Op Amsterdam zelf is op dit moment meer reserve capaciteit beschikbaar dan op de meeste andere concurrerende vliegvelden. Dit kan er toe leiden dat een low cost airline zich hier eerder zal vestigen, een voorbeeld van dergelijke ontwikkelingen is Madrid.
Op dit moment zijn er al goede voorbeelden van low cost airlines die als feeder dienen voor hub carriers:
Iberia en Vueling
West Jet en KLM
Flybe en Air France
BA en Air Berlin
Sommige van deze carriers zijn meer hybride dan daadwerkelijk low cost van aard.

De termijn waarop dit kan plaatsvinden is onzeker. Deze trend kan echter zeer snel om zich heen grijpen. In markten met voldoende capaciteit is deze kans zeer aanwezig. De grootte van het huidige netwerk van low cost airlines maakt het daadwerkelijk mogelijk een feeder systeem te exploiteren.

Interessante aspecten bij een samenwerking zijn o.a. de bagage afhandeling

Continue groei Europa
Er is een continue groei waarneembaar in Europa, echter zijn veel airlines bezig met schaalvergroting waardoor de hoeveelheid verkeer rond het 0-punt zwabbert.

De KLM bijvoorbeeld heeft de fokker toestellen vervangen door Embraer toestellen waardoor er geen toestellen meer zijn met een capaciteit lager dan 80 stoelen.

Dit heeft ertoe geleid dat veel van de vluchten onderbezet zijn.

Schaalverkleining internationaal
De KLM heeft de laatste jaren in de intercontinentale markt juist schaalverkleining doorgevoerd waardoor grotere vliegtuigen zoals de 747 langzamerhand zijn vervangen door vliegtuigen zoals de 777. Hierdoor is er minder capaciteit beschikbaar in het vliegtuig maar kan de KLM wel een hogere bezettingsgraad behalen.

Opkomende markten
KLM is bezig zijn netwerk te versterken in opkomende markten zoals China en Brazilië en beschouwt het overige gedeelte van haar netwerk als af.

Positie Schiphol

Strengths
In tegenstelling tot de concurrerende luchthavens heeft Schiphol redelijk veel reserve capaciteit.

Schiphol heeft een relatief groot netwerk.

De KLM is sterk in de Noord Europese markt en de Midden Europese markt

Weaknesses
Schiphol heeft een relatief beperkte kleine O&D markt, zeker in vergelijking met Londen en Parijs.

De kwetsbaarheid van Schiphol is groot, als het met de KLM niet goed gaat heeft dit effect op Schiphol.

Opportunities
De bereikbaarheid van de luchthaven is van groot belang. De ticket tax in Duitsland heeft ertoe geleid dat inwoners van het grens gebied eerder geneigd zijn via Schiphol te vliegen.
De aansluiting op de hoge snelheidslijn Oost kan voor Schiphol veel voordelen opleveren. Nord Rhein-Westfalen is een van de grootste markten van Europa. Als de aansluiting goed wordt vormgegeven kan het voor Schiphol meer passagiers opleveren dan dat het verliest aan luchthavens zoals Frankfurt.

Threats

De opkomst van de grote carriers vanuit het Midden Oosten vormen een grotere bedreiging voor Schiphol en Frankfurt dan voor andere luchthavens omdat deze afhankelijker zijn van hun feeders van kleinere Europese luchthavens. Terwijl Midden Oosten carriers de kleinere vliegvelden juist direct gaan aanvliegen vanuit hun hub. Deze carriers hebben grote voordelen ten opzichte van Europese carriers omdat ze te maken hebben met goedkopere arbeidsplaatsen, belastingvoordelen, een goede geografische locatie van de hub. Het afweren van deze carriers is enigszins hypocriet na het eerdere streven van liberalisatie en zal op de lange termijn niet werken. Een recent rapport van de Royal Bank of Scotland heeft overigens aangetoond dat het met de concurrentie op de langere termijn voor Europese carriers mee zal vallen omdat deze carriers zich vooral op specifieke markten richten zoals de Indiase. De A380 verbinding met Manchester wordt bijvoorbeeld voornamelijk overeind gehouden door de grote populatie mensen van Indiase afkomst in Manchester.

Frankfurt zal binnenkort een nieuwe baan in gebruik nemen waardoor de capaciteit zal gaan stijgen. Voor Londen geldt dat ze nog steeds op zoek zijn naar een locatie voor een nieuwe landingsbaan, deze zal waarschijnlijk niet op Heathrow komen.

Nieuwe vliegtuigen zoals de A350 en de B787 maken het mogelijk door hun grotere bereik en kleinere capaciteit om direct langere routes te vliegen die niet per definitie via een hub afgehandeld hoeven worden. Een dual hub strategie zoals tegenwoordig vaak gebruikt in het verband tussen Delta en KLM zou in de toekomst eventueel vervangen kunnen worden door een single hub variant, waarbij Delta vanuit de VS direct op de verschillende kleine plaatsen in Europa kan vliegen. Dit kan eveneens omgekeerd werken waardoor het in het voordeel van Schiphol kan uitvallen.

Als de intercontinentale verbindingen wegvallen, zal Schiphol verschrompelen tot een Europese luchthaven met enkele continentale verbindingen die aansluiten bij de O&D markt.

Onzekerheden

Volatiliteit olie prijzen

De volatiliteit van olie prijzen blijft boven de markt hangen. De olieprijs bepaald in grote mate de ticket prijs, deze is direct van invloed op de vraag naar vlieg verkeer. Het gebruik van olie zal naar verwachting belangrijker worden na de discussie rondom nucleaire energie. Daarnaast zal de vraag naar olie toenemen door groei in opkomende economieën zoals China en India. De beperkte capaciteit bij raffinaderijen ligt ten grondslag aan dit probleem. Doordat er weinig tot geen buffers beschikbaar zijn valt de volatiliteit in prijs niet op te vangen.

European Trading Scheme


Milieubewustzijn

Aan de basis van het ETS ligt het milieubewustzijn van de maatschappij. Op dit moment is de KLM een voorloper in duurzaamheid en milieubewustzijn. Het is de vraag in hoeverre de consument dit nu

Afhankelijkheid KLM
De passagiersgroei op Schiphol is in grote mate aanbod gestuurd. De KLM heeft aangegeven dat haar netwerk op Schiphol bijna voltooid is. De gaten hierin worden gevuld door verbindingen met opkomende economieën in China en Brazilië.

Nigel Denis gaf aan dat er een groot aantal lijnen is waarop de KLM een monopolie positie heeft. Op deze lijnen kan de KLM een hogere prijs vragen dan op andere lijnen en hoeft zij minder rekening te houden met de ideale vliegtijden. Deze monopolies zijn voor de marge van de KLM van groot belang. Angstvallig wordt er door de KLM gekeken naar ontwikkelingen van andere carriers, met name Lufthansa, van hun noord Europese netwerk.

Voor de KLM is het essentieel dat er een substantieel percentage O&D reizigers in de vluchten aanwezig is omdat op deze passagiers de winstmarge het grootste is. Zo is bijvoorbeeld de vlucht naar Hydrabad geschrapt, ondanks de hoge bezettingsgraad, bestond deze vlucht uit 90% transfer passagiers.

De KLM is in het verleden vaak een richtinggevende airline geweest, te denken valt o.a. allianties en open sky agreements. In China is de KLM nu nog een voorloper met relatief grote marges die zullen verkleinen als andere airlines ook actief worden in deze markt.

Overige
Voor het vervolgonderzoek is het van belang goed gebruik te maken van scenario’s.
Interview Frank van der Zwan TU Delft Delft 13 Mei

Trend
De verandering in de passagiersstromen wordt voornamelijk veroorzaakt door een verandering van vraag vanuit en naar het Verre Oosten en Midden Oosten (ook als bestemming) in combinatie met een mate van verzadiging van de markt in de VS en Europa. Achterliggende factoren hierbij zijn de bevolkingsgroei en de opkomst van de middenklasse. Elk van de golfstaten uit het Midden Oosten heeft een eigen strategie voor ontwikkeling van haar economische positie. Zo is Qatar gefocust op duurzaamheid en cultuur en is Emirates (Dubai) meer gefocust op het ontwikkelen van verkeer en nieuwe routes. Vooral de vraag uit China en India zal toenemen terwijl de groeipercentages vanuit Zuid Amerika en Afrika achter zullen blijven. Dit wordt bij Afrika veroorzaakt doordat er weinig veranderingen in de economische positie. Zo is Qatar gefocust op duurzaamheid en cultuur en is Emirates (Dubai) meer gefocust op het ontwikkelen van verkeer en nieuwe routes.

Een andere trend is de verdere ontwikkeling van low cost airlines. Zo zijn de low cost carriers steeds meer business passagiers gaan vervoeren zoals bij Easyjet bijvoorbeeld het geval is. Door de low cost carriers zal in de toekomst vliegen naar verwachting hoger zullen worden betalen vanuit ticketprijzen omhoog gaan door hogere vaste kosten (low cost carriers worden steeds meer deel van de establishment, met een ouder wordende crew en vliegtuigen en bijbehorende kosten).

Het is de vraag of de low cost airlines als vervanging kunnen dienen voor het feeder systeem van de gevestigde carriers. Immers speelt voor de zakenreiziger connectiviteit een zeer belangrijke rol en deze connectiviteit zal vooral bij obscuurere bestemmingen minder snel te behalen zijn. Voor een eventuele samenwerking tussen gevestigde carriers en low cost airlines dient het verdienende model te worden. KLM verdient bijvoorbeeld zeer weinig aan het vervoer van Malmö naar Amsterdam voor een intercontinentale vlucht, maar wil deze passagier wel aan boord hebben op het intercontinentale deel van de vlucht. Voor de zakenreiziger zijn een aantal aspecten belangrijk maar vooral connectiviteit, een directe vlucht en frequent flyer programma (waarbij de eerste twee vereisten zijn en de derde daarna van doorslaggevend belang is) zijn van groot belang. Er is bij de legacy carriers ook een verschuiving te zien waarbij er steeds meer in comfort class wordt gereisd, dit gaat ten koste van de businessclass. KLM streeft meer naar verbetering van het hub en spoke netwerk. Om zo veel als mogelijk passagiers te genereren is zij bijvoorbeeld gestopt met het direct vliegen van Rotterdam naar bestemmingen die ook vanuit Amsterdam aangevlogen worden, om zo kannibalisatie van de hub tegen te gaan. Naast connectiviteit binnen een maatschappij of tussen verschillende maatschappen bestaat er ook nog de informele connectiviteit. Reizigers die zelf hun connectie regelen door aparte vluchten te boeken.

Airbus en Boeing hebben traditioneel twee enigszins contrastende toekomstbeelden. Hierbij ziet Airbus vooral groei in het segment met de grote capaciteit vliegtuigen voor de trunk routes terwijl Boeing zich juist meer richt op de medium sized vliegtuigen voor de langere routes.

Loyalty programma’s voor bepaalde segmenten worden steeds belangrijker. Helemaal omdat de passagier steeds geëmcancipeerder wordt. Deze kent de trucjes van de airlines en weet waar en wanneer te boeken en te kijken. Toekomstige generaties zijn in ieder geval veel meer gericht op het internet. Daarbij komt dat de airlines ook steeds beter in de gaten krijgen dat de focus meer op de passagier moet liggen. Zelfs Ryanair heeft aangegeven dat de houdbaarheidsdatum van haar huidige strategie bijna bereikt is.
Het niet behalen van de winsten door airlines is een andere belangrijke trend die impact kan hebben op de sector. In het verleden heeft de sector aangetoond dat het patroon van winst en verlies erg cyclisch verloopt.

Onzekerheid
Het European Trading Scheme (ETS) vormt een bedreiging voor de Europese luchtvaart en voor Schiphol. Echter er is geen airline die werkelijk weet wat voor een impact het ETS gaat hebben op de vliegindustrie. Gelet op het – per definitie – mondelinge karakter van de luchtvaart is het niet verstandig en niet realistisch om dit alleen als Europa in te voeren. Dit hangt ook mede samen met de ontwikkeling van de brandstofprijzen. Mogelijk wordt het straks goedkoper om vanuit de Verenigde Staten via Afrika naar Azië te vliegen. Afrikaanse maatschappijen zoals Ethiopian en Kenya Airways spelen hier al op in.

Er zal in ieder geval schaarste optreden want voor de ontwikkeling van het ETS systeem wordt gebruik gemaakt van de levels van 2006/2007, dit betekent dat er 15% emissierechten ingekocht dient te worden (t.o.v. die oude niveaus) plus emissierechten voor het verschil tussen huidige en ‘oud’ niveau. Over het algemeen zijn de groeipercentages van de luchtvaart twee keer zo hoog als die van het BNP.


Op langere termijn zullen ook andere effecten optreden. Het gebruik van biofuels zal toenemen en er zal geprobeerd worden om de vliegtuigen zo efficiënt mogelijk te opereren. Echter een vliegtuig heeft een verdienmodel voor ongeveer 40 jaar. Pas na deze tijd kunnen de huidige “vervuilende” vliegtuigen uit de operatie worden genomen.

Positie Schiphol
Er zijn een aantal ontwikkelingen die de hub positie van Schiphol aantasten. Allereerst zijn er door de ontwikkeling van nieuwe vliegtuigen mogelijkheden om Schiphol over te slaan als hub door het dual hub systeem te vervangen door een single hub systeem (Paris-Amsterdam). Een tweede ontwikkeling is de opkomst van Afrikaanse carriers die een aantrekkelijk alternatief vormen voor de hub airports van Europa (Ethiopian air, Kenya airways).

Het ETS zorgt voor een bedreiging voor de positie van Schiphol. Zodra het ETS systeem wordt ingevoerd en vooral als deze alleen in Europa wordt ingevoerd dan is het CO₂ technisch gezien veel voordeliger om met een kleiner vliegtuig zoals de 787 direct naar Hamburg te vliegen in plaats van eerst via Schiphol [ in plaats van wat?]. Hiernaast kunnen vluchten die nu via Europa plaatsvinden worden gedaan via andere continenten.

Ten tijde van de fusie tussen KLM en Air France zijn er afspraken tussen de overheden gemaakt met betrekking tot de connectiviteit van beide hubs en de positie van twee airlines. De houdbaarheidsdatum van veel van deze afspraken is al overschreden of zal snel overschreden worden. De vraag is wat het gevolg zal zijn voor Schiphol als hub luchthaven. Uitholling van Schiphol kan een risico vormen. Alleen vluchten die nog verzorgd kunnen worden met de huidige O&D markt vinden plaats via Schiphol, andere kunnen worden uitgeplaatst naar bijvoorbeeld de hub van Air France. Zodoende zou de positie van Schiphol in een negatieve spiraal terecht komen.
Op het moment zijn hier echter nog geen aanwijzingen voor. De werking van beide hubs is complementair aan elkaar, daarnaast is het netwerk voor een gedeelte verschillende per hub. Zo is Schiphol vooral gefocust op het Verre Oosten en Amerika en het Oostelijk deel van Afrika en heeft Parijs een sterkere positie van oudsher in Noord Afrika, West Afrika en Zuid Amerika.

De environmental capacity is een belangrijke voorwaarde voor groei op Schiphol. Deze is echter op andere luchthavens zoals Heathrow rampzalig.

Er is een spanningsveld tussen Schiphol en de KLM. De KLM verdient het meeste aan de business passagier. Echter dit is niet dezelfde reiziger aan wie Schiphol veel verdiend. Schiphol is meer gebaat bij de families die vroeg op het vliegveld aanwezig zijn en daar veel uitgeven.
Appendix 5 Causal relationship diagram
The future traveller; a scenario study towards different futures for secondary European hub airports
Arjan de Witt, TU Delft
November 2011

Abstract
This paper defines the trends and uncertainties for secondary European hub airports. Secondary European hub airports have a limited catchment area, a number of intercontinental connections and a hub carrier that also serves a bigger hub airport. The paper outlines the qualitative part of a graduation project for Schiphol airport. Semi structured interviews and literature review form the basis of this research. The research question is as follows: “What will be the main future trends and uncertainties for secondary hub airports in Western Europe?” The two major trends that will shape aviation in the next decades are the emerging economies and the ageing of the developed world. Next to these trends, the development of secondary airport is subjected to a number of uncertainties. The major uncertainties are bundled into three scenarios. The first scenario describes the event of de-hubbing. De-hubbing is known as “partial or complete abandonment of a hub by the dominant carrier”. The likelihood for de-hubbing increased by deregulation, consolidation within Europe, hub bypassing, the rise of Middle Eastern carriers and the increasing environmental awareness. The second scenario describes the cooperation between low cost airlines and network carriers at secondary airports based upon the convergence between network and low cost airlines and the focus on long haul by network carriers. The third scenario elaborates on an increased environmental awareness within Europe. The impact of the emerging economies is dependent on the airlines, meanwhile new cultures, habits and languages will affect terminal services heavily. Ageing will know a heavy impact over all segments focusing on the categories walking, waiting and way finding. De-hubbing could change secondary hub airports drastically. The effect of low cost and network carrier cooperation is limited. There are opportunities for hub airports to gain more market share by promoting this cooperation. The effect of environmental awareness measures is dependent on the scale and the size of these measures and will affect secondary airports more heavily than primary airports.

Key terms: strategic decision-making, scenarios, secondary hub, air transport, trends

1. Introduction
The impact of aviation is large, within The United States and Europe the airline industry is directly accountable for 1% of GDP and indirectly it provides services and possibilities to do business internationally (Button 2008). The airline industry is a very complex ever changing industry that is nowadays turning from a traditionally very bilateral organised market towards a more open market worldwide (Doganis 2010). After the liberalization of the European market in the early ‘90’s, airlines adopted new business models resulting in hub and spoke networks, strategic alliances and low cost airlines (Burghouwt and Huys 2003). Hub airports do have an important role in the current network of international air carriers, whereas direct flights between smaller and medium sized airports are replaced by flights via the airline’s hub airport (Dennis 1994; Frenken, Van Terwisga et al. 2003). Nowadays the role of major European hub airports is changing. The heavy competition in the industry, the small margins and the surplus of capacity on certain routes require airlines to cooperate or even merge (Buffsart 2006; Doganis 2011; Heerkens 2011). Recent European consolidation changed the environment for airports whereas by the acquisition of multiple carriers dual or even multihub airlines arose. In these dual or multihub networks, primary hub airports can be distinguished from secondary hub airports. Examples of secondary hub airports are, Amsterdam Airport Schiphol, Madrid and Zurich (Gourgeon ; IAG 2011; KLM 2011; Lufthansa Group 2011). These secondary
airports, as defined in this paper, do have a limited catchment area, a number of intercontinental connections and a hub carrier that serves also another bigger hub airport. Nigel Dennis already described in his paper the vulnerability of secondary hub airports by the natural monopoly of the hub carrier and the limited size of the catchment area (Dennis 2005). This paper will discuss the different futures for these secondary hub airports specific up to 2040.

2.1 Research
This paper will give an overview of some of the main findings of a graduation project for Schiphol airport. Whereas the project consisted of a qualitative and a quantitative part, this paper will solely describe the outcome of the qualitative phase. It is based on an extensive literature review combined with knowledge obtained by seven semi structured interviews. The literature review combines both scientific information and information retrieved from consultancy firms. The seven interviews were conducted within the Netherlands, with experts in the field of aviation or directly linked industries, four expertises are distinguished: leisure, research institutions, airlines and governmental organizations. The information obtained was combined with data and information retrieved from the Schiphol Group. Next, different scenarios were composed to describe the major uncertainties.

2.2 Research Questions
The main research question addressed in this paper is: "What will be the main future trends and uncertainties for secondary hub airports in Western Europe?" This main question is divided into the following sub questions:
What are the major trends for secondary hub airports?
What are the major uncertainties for secondary hub airports?
What will be the impact of these trends and uncertainties on secondary hub airports?
For this research trends and uncertainties are distinguished. Trends are defined as events that are likely to occur; the effect of these trends on the longer term is more or less unknown. For uncertainties on the other hand, the likelihood of occurrence is also unknown.

3. Trends
In general, the air traffic market will continue to grow (Button 2008; Veldhuis 2011). Two trends will shape European aviation in the coming years: the upcoming economies and the ageing of the developed world (Cornelisse and Pronk 2011; Heerkens 2011; Peeters 2011; Van der Most 2011; Van der Zwan 2011). These trends will affect air traffic as they put new needs and requirements to the sector.

3.1 Upcoming economies
Traditionally Europe and the US were the main drivers for the growth in air transport demand. For the next decades, it is expected that the biggest increase in volume will be derived from the upcoming economies (Airbus 2011; Boeing 2011). Especially the so-called BRIC- countries (Brazil, Russia, India and China) will know an exponential growth. In 2020 the four countries together will represent 35% of the global aviation market (Kim, Poponak et al. 2010). The Asian markets, in particular China and India are expected to perform best (Airports Council International 2010; OECD 2010; Van der Zwan 2011), pushed by the growing middle class (European Commission 2010). New destinations in upcoming economies will be added to the extensive network of the European airports in the next years (De Wit 2011). Meanwhile passengers from these upcoming regions will bring other cultures, languages and habits towards the European airports affecting operations.

3.2 Ageing
The ongoing ageing trend in the developed world is expected to continue in the near future and will affect air traffic (Van der Most 2011). Ageing is defined as the increasing proportion of elderly in the population (Department of Economic and Social Affairs 2009). Underlying factors are the decline of fertility rates and a longer life expectancy, which are caused by an improved global health (World Health Organization 2011). In particular Western Europe, Japan and North
America are heavily influenced by this phenomenon.

4. Uncertainty analysis
Future developments of secondary hub airports are dependent on a number of uncertainties. The major uncertainties are bundled into three specific scenarios: de-hubbing, low cost development

4.1 De-hubbing
De-hubbing is known as “partial or complete abandonment of a hub by the dominant carrier” (Redondi, Malighetti et al. 2010). In the period from 1997 until 2009, 37 airports from a total of 123 hub airports worldwide were de-hubbed, meaning that they lost at least 75% of their number of connections. Network restructuring, mergers, downsizing and bankruptcy were the main causes of these de-hubbing examples (Redondi 2011). For secondary hub airport decisionmakers de-hubbing is considered an uncertainty because of its unknown effect and unknown existence. Traditionally the, nowadays secondary hub airports had multiple structural advantages above other hub airports. These structural advantages comprised the availability of bilateral traffic rights, a good geographical position and a worldwide dominant hub carrier. Due to the disappearance of these structural advantages and upcoming market changes and uncertainties, the vulnerability for de-hubbing at these secondary airports increases (Heerkens 2011).

Nowadays, bilateral agreements are more and more discussed by the European Union as a whole (Reichmuth, Ehmer et al. 2008). This weakens the position of traditionally secondary hub airports whereas the competition intensifies. Meanwhile due to the last decade’s consolidation within the European aviation market, three European airline groups operate a multi hub strategy for their network, whereas a single hub strategy is more cost efficient. A multi hub network becomes only feasible when different geographical markets are served, when there is a lack of capacity at the primary hub or with the existence of a large local market (Burghouw ; Burghouwt 2007). With the expected ongoing consolidation within the European airline industry more secondary hub airports will be included in one of the airline groups. The existing mutual dependency between airlines and airports may shift into a higher dependency of airports on airlines. Next, urbanization and the development of smaller long range planes (Boeing 787/ Airbus A350) increase the feasibility for point to point connections (Doganis 2010). Hub airports, especially those with a limited hinterland, risk losing their position by a lack of transfer passengers.

Figure 32 Hub bypassing by ongoing urbanization and the development of smaller long haul planes for secondary hub airports with a limited hinterland

Another potential threat for the European secondary hub airports is the rise of the Middle Eastern carriers. Middle Eastern carriers have in general uneven advantages upon other carriers (Cornelisse and Pronk 2011; De Wit 2011). The Middle Eastern carriers connect smaller European cities by their Middle Eastern hubs to Asia and Oceania, directly attacking the hub operations of European carriers that are dependent on the same connections to smaller regions (De Wit 2011). Especially on the Indian market the existence of these carriers is huge (Air India 2009). Middle Eastern airports can both benefit and damage the position of secondary hub airports, as it creates new market demand but at the same time directly attacks the hub system of the incumbent hub carrier.

Last, the increasing environmental awareness along with environmental protection measures could also possibly affect de-hubbing at European secondary airports. Due to protection measures as the environmental trading scheme, hub airports in Africa, the Middle East and at the border of the European
Union might benefit. This will directly damage the position of secondary hub airports in Europe (Van der Zwan 2011). Meanwhile transfer traffic within Europe could become relatively more expensive which will decrease the amount of transfer traffic. In particular secondary hub airports will suffer.

4.2 Low cost development
The development of low cost carriers, other call them low fare or no frills companies, started in the 90’s based on the US business models of South West and Valuejet. Their success is based on offering a low level of service, having high passengers’ loads and quick turnaround times. Low cost airlines nowadays mainly operate as point to point carriers, transporting Origin and Destination passengers with one or two types of airplanes across Europe (Buffaerts 2006). In contrary to the primary airports, many of the European secondary hub airports are served by low cost airlines as well. It is expected that the low cost segment will rise in the coming years because network carriers will increasingly focus on the long haul connections (Doganis 2011). Meanwhile an ongoing convergence in costs and services between network carriers and low cost airlines will take place (HHI Leipzig Graduate School of Management 2010). Easyjet for example is increasingly focusing on the business passenger (Easyjet 2010). In the next decade further consolidation within the low cost market will take place and new business models will be developed for this industry.

As a result many experts emphasize the possibilities of cooperation between a network carrier and a low cost carrier (Airtheth 2011; De Wit 2011; Forsyth, Niemeier et al. 2011; Heerkens 2011). Until now in Europe this phenomenon is limited to subsidiaries of major carriers like Iberia and Vueling, Transavia and KLM. These examples demonstrate the willingness of people to use low fare companies as feeder for intercontinental flights (De Wit 2011).

4.3 Environmental awareness
Air travel is responsible for 2% until 3% of CO2 emissions and also a significant amount of other greenhouse gasses (Owen, Lee et al. 2010). Some expert expect this amount to increase exponentially in the future (Peeters 2011). The growing environmental awareness in Europe can be seen as a threat for the European aviation industry, as the industry is not able to easily reduce the emissions. Policy measures forced by governments to reduce the emissions will influence the demand for airline industry and, depending on the substance of these measures, will disturb the level playing field in world aviation. One of the policy measures agreed to by the European Commission is the introduction of the emission trading scheme for the aviation industry. At the moment there are a lot of unknowns about this scheme. European airlines prefer the introduction of the scheme worldwide, as they airlines are worried about the disturbance of the level playing field by the ETS, when the system does not include all airlines (Cornelisse and Pronk 2011).

5. Impact
This paragraph addresses the following question; what could be the impact of the uncertainties and trends on the future development of secondary European hub airports?

5.1 Emerging economies
For many of the emerging economies the question is not if there will be any impact on air travel but when and how big this effect will be. In general, the exact long term impacts are hard to determine. Both airplane manufactures Boeing and Airbus have differences in their forecasts of more than 1.0% in subsequent years over a period of 20 years (Airbus 2011; Boeing 2011).

Although all BRIC markets are expected to rise in the future, many differences between these markets exist. China and India for example do have a smaller disposable income per capita than the other two countries (Kim, Poponak et al. 2010). At the same time, deregulation plays an important role, India is still heavy regulated (Cornelisse and Pronk 2011). The distance between the emerging economies and Europe is also inversely proportional to the attraction of passengers (Groesch, Rothlauf et al. 2007). The secondary hub airports tend to specialize on one or two of these BRIC’s, indicated in
The attraction of passengers from a specific BRIC country is for secondary hub airports very dependent on strategic choices of the airline.

Figure 33 Number of destinations served from the European airports in each country (Luchtvaartnieuws 2011).

As elderly tend to have other and highly accustomed with air travel and have their de-hubbing strategies and their de-hubbing monitor system.

5.3 De-hubbing
From all scenarios, de-hubbing will have the most impact on the airport’s model. De-hubbing and its effect are dependent on a number of different variables. De-hubbing is more likely during economic downturn. There are just a few examples of airports that were able to rehub again (Redondi 2011). At the same time de-hubbing offers possibilities for decision makers at airports, because the airport is less dependent on their hub carrier. De-hubbing often leads to an increase of the low cost segment.

All European secondary hub airports should have their de-hubbing strategies and their de-hubbing monitor system.

5.4 Low cost development
Secondary European hub airports are very sensitive for the further low-cost development. First, secondary airports are often used by low cost airlines as well as network carriers offering long haul connections. Second, they are more dependent on their hub and spoke network than primary hub airports, because of their limited catchment area. While slot capacity at primary airports is scarce, secondary airports often have a number of slots available for low cost expansion. At the same time fees are often lower at secondary airports (Warnock-Smith and Potter 2005).

Secondary airports can benefit from similar developments at it enriches their product. This cooperation between network and low cost airlines is only available for a small number of European connections.
Connectivity is essential within the hub and spoke network. The cooperation between a low cost and a network carrier will increase the attractiveness of the secondary hub airport, as a lower priced product can be offered. New facilities are needed at the airport or at airlines to facilitate this change such as baggage transfer possibilities and labelling (Heerkens 2011).

5.5 Environmental awareness
The impact of the increasing environmental awareness and its policy measures for airport are uncertain. The impact of a solely European measure will be higher for secondary hub airports than a worldwide measure as they are dependent on hub traffic. Transfer traffic will become relatively more expensive, while Middle Eastern and African airports could gain market share. At the same time airports can anticipate on the increasing sustainable awareness.

6. Conclusion
This paragraph will answer the research question from paragraph 2; “What will be the main future trends and uncertainties for secondary hub airports in Western Europe?” Two determining trends are defined; ageing and the emerging economies. The impact of ageing will be huge at secondary airports as it affects all segments. Future elderly are different from the existing ones. They are in better health, highly motivated, more digitized and able to spend more. New services should focus on walking, waiting and way finding. For secondary airports, the impact of emerging economies is mainly dependent on the hub airline. Overall secondary airports are concentrated on one or two emerging economies. Primary airports are in general more equally present in all emerging regions. New habits, cultures and languages urge airports to change their facilities and services. A major uncertainty for secondary airports is de-hubbing. Influenced by consolidation, new competitors (mainly from Middle East), deregulation and hub bypassing the chances for de-hubbing for secondary airports might increase in the future. The impact of de-hubbing can be huge.

After the expansion of the low cost segment in the last 15 years, consolidation in the industry is expected. Cooperation between network carriers and low cost carriers are forecasted. Secondary airports are specific dedicated to these changes as most primary airports do not have low cost services. Although the impact of these changes is small, airports can attract new passengers by offering a better product. A final uncertainty is the environmental awareness and the proposed environmental protection measures. Dependent on the outlook of these measures, the impact can be large. Especially for secondary hub airports who are dependent on the transfer segment.

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