A SUSTAINABILITY ANALYSIS OF TURKISH BANKS USING THE ANALYTIC HIERARCHY PROCESS

SEMİH BULUT

BOĞAZİÇİ UNIVERSITY

2017

A SUSTAINABILITY ANALYSIS OF TURKISH BANKS USING THE ANALYTIC HIERARCHY PROCESS

Thesis submitted to the

Institute for Graduate Studies in Social Sciences

in partial fulfillment of the requirements for the degree of

Master of Arts

in

International Trade Management

by

Semih Bulut

Boğaziçi University

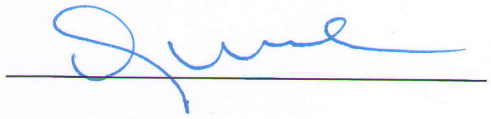
2017

A Sustainability Analysis of Turkish Banks Using the Analytic Hierarchy Process

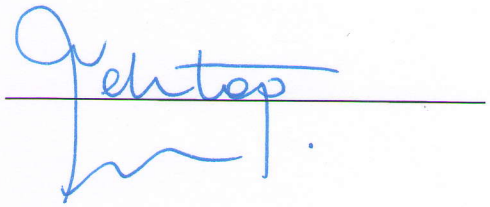
The thesis of Semih Bulut

has been approved by:

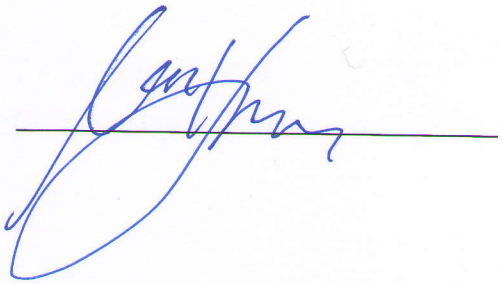
Assoc. Prof. Gözde Erhan Ünal
(Thesis Advisor)



Assist. Prof. Mehtap Işık



Assist. Prof. Murat Küçükvar
(External Member)

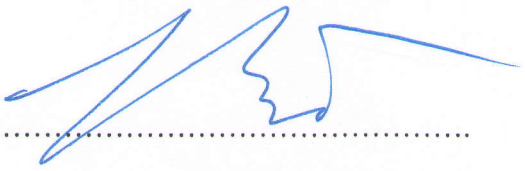


February 2017

DECLARATION OF ORIGINALITY

I, Semih Bulut, certify that

- I am the sole author of this thesis and that I have fully acknowledged and documented in my thesis all sources of ideas and words, including digital resources, which have been produced or published by another person or institution;
- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
- this is a true copy of the thesis approved by my advisor and thesis committee at Boğaziçi University, including revisions required by them.



Signature .....

Date 27/02/2017

ABSTRACT

A Sustainability Analysis of Turkish Banks Using the Analytic Hierarchy Process

Sustainability is a concept that aims to improve the reliability, continuity and robustness of organizations. In this study, we aim to generate a sustainability index by analyzing the sustainability reports and performances of the four biggest privately owned Turkish banks during the periods of 2013, 2014 and 2015. The sustainability performances of the four selected banks of Turkey, which constitute 40% of the overall financial sector, gives us an idea about the overall sustainability performance of financial institutions in Turkey. In order to compare the performances of these four banks within the study period, we analyzed a total number of 19 indicators according to three criteria: economic (9), social (6) and environmental (4). After collecting the social, economic and environmental indicators data from the banks, we designed a survey to take the opinions and preferences of the sustainability experts from academia and the financial sector for determining the weights of each sustainability criteria. The specific indicators (sub-criteria) of economic, social and environmental performances were weighed using expert judgements in the survey. Thus, we aimed to determine the relative importance of each indicator and sub-indicator. In order to rank the sustainability performances of the banks, we used one of the most commonly used multi-criteria decision making models: the Analytic Hierarchy Process (AHP). The ultimate objective is to sort the banks from the most to the least in sustainability.

ÖZET

Analitik Hiyerarşi Süreci ile Türk Bankalarının Sürdürülebilirlik Analizi

Sürdürülebilirlik kavramı kuruluşların güvenilirliğini, devamlılığını ve sağlamlığını geliştirmeyi hedefleyen bir yaklaşımdır. Bu tez, Türkiye'de faaliyet gösteren dört büyük özel bankanın 2013, 2014 ve 2015 yıllarını kapsayan sürdürülebilirlik raporları ve performansları analiz edilerek sürdürülebilirlik endeksi oluşturmayı amaçlamaktadır. İncelemeye konu ettiğimiz Türkiye'de finansal sektörün 40%' ını oluşturan dört büyük banka ile Türkiye'nin finansal kurumlarının genel sürdürülebilirlik performansına ilişkin bir fikir edinilebileceği düşünülmektedir. Bu dört bankanın çalışmamızı kapsayan süredeki performanslarını karşılaştırmak için dokuzu ekonomik, altısı sosyal, dördü de çevresel göstergeler olmak üzere toplam 19 göstergeyi analiz ettik. Bankaların sosyal, ekonomik ve çevresel göstergelerinin verilerini topladıktan sonra, her bir sürdürülebilirlik ölçütünün ağırlıklarının belirlenmesindeki deneyimlerinden faydalanabilmek için akademik ve mali sektörden sürdürülebilirlik uzmanlarının görüş ve tercihlerini almak için bir anket hazırladık. Ekonomik, sosyal ve çevresel göstergelerin spesifik alt göstergeleri (alt kriterler) uzmanların değerlendirmeleri ile ağırlıklandırılmıştır. Buradan hareketle, her göstergenin ve alt göstergenin nispi önemini belirlemeyi amaçladık. Bankaların sürdürülebilirlik performanslarını sıralamak için yaygın olarak kullanılan çok kriterli karar verme modellerinden biri olan Analitik Hiyerarşi Sürecini (AHP) kullandık. Nihai hedef, bankaları sürdürülebilirlik açısından en iyi performans gösterenden en kötü performans gösterene doğru sıralamaktır.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my thesis advisor, Assoc. Prof. Dr. Gözde Erhan Ünal, for her patience and guidance throughout my studies.

I would like to thank the rest of my thesis committee, Assist. Prof. Murat Küçükvar and Assist. Prof. Mehtap Işık, for their insightful comments and guidance.

In addition, I extend a thank-you to Assist. Prof. Ahmet Bulut, who introduced me to R and his enthusiasm for teaching.

Finally, I must express my very profound gratitude to my parents and to my wife Özlem Bulut, and my dear daughter, İpek Yaz Bulut, for providing me with unfailing support and continuous encouragement. This accomplishment would not have been possible without them. Thank you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AHP: Analytic Hierarchy Process

ANIPE: Average Net Income Per Employee

APEPP: Average Personnel Expenses Per Employee

ATPE: Average Training Per Employee

BRSA: Banking Regulation and Supervision Agency

CAR: Capital Adequacy Ratio

CERES: Coalition for Environmentally Responsible Economies

COPRAS: Complex Proportional Assessment

CR: Corporate Responsibility

CSR: Corporate Social Responsibility

DJSI: Dow Jones Sustainability Index

EIPE: Energy Intensity Per Employee

ER: Efficiency Ratio

ESG: Environmental, Social and Corporate Governance

ET: Employee Turnover

ETR: Effective Tax Rate

EUPE: Electricity Used Per Employee

GHG: Green House Gases

GHGIPE: Green House Gas Intensity Per Employee

GRI: Global Reporting Initiative

MAUT: Multi-Attribute Utility Theory

MAVT: Multi-Attribute Value Theory

MCDA: Multi-Criteria Decision Analysis

MCDM: Multi Criteria Decision Making

NPL: Non-Performing Loans

NR: Net Revenue Growth

OM: Operating Margin

ROA: Return on Asset

ROC: Return on Capital

ROE: Return on Equity

SMART: Simple Multi-Attribute Rating Technique

TBB: The Banks Association of Turkey

TOPSIS: Technique for Order Preference by Similarity of Ideal Solution

UNEP: United Nations Environment Programme

US: United States

WIM: Women in Management

WIPE: Water Intensity Per Employee

WIW: Women in Workforce

WPM: Weighted Product Model

WSM: Weighted Sum Model

CHAPTER 1

INTRODUCTION

Corporate strategies set by the Boards of the financial institutions have direct impact on their stakeholders. Currently, most of the companies regard sustainability reports as an inseparable part of the annual reports. Integrated reporting, which underlies a more holistic philosophy of considering not only financial capital but all relevant factors such as manufactured, intellectual, human, social and natural capital, focuses on the corporate strategy and has future orientation. This approach is gaining more and more followers both in private and public sectors and not-for-profit organizations. Long term corporate growth, profitability, and competitiveness are directly related with the sustainability of the institutions. The economic, social, environmental and governance indicators are at the heart of the business continuity. "Development" and "economic growth" are two concepts that are sometimes used synonymously. However, economic growth itself is not enough for development. Where as economic growth increases welfare of countries, reduces poverty and contributes to human development, it is not sufficient to solve social and environmental issues that are very important in development. Development is a holistic phenomenon involving not only economic progress, but also social and environmental progress of companies, regions, countries and nations all together. For a sustainable development, decision makers need a balance in economic, environmental and social aspects of their actions.

According to World Commission on Environment and Development, sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Countries have seen that the sense of achieving present day development is not adequate to accomplish sustainability. In recent years, human beings are facing with a lot of problems such as global warming, pollution, depletion of natural resources, poverty, gender inequality, racism, human right violations, corruption and the list goes on. During the industrialization period, developed countries manufacturing types, energy consumption, greenhouse gas emissions and high technology applications had endangered less developed country citizens' life.

Although, recent developments in corporate social responsibility issues were adopted quicker in developed countries than in less developed countries, the whole world is still paying the cost of the damage that was created in the past. In order to reap the benefits of the global market and realize their profit maximization goals, multinational companies had threatened lives of poor people without hesitation. Nevertheless, this short term profit oriented perspective was unsustainable not only for relatively poor and less developed societies but also for exploiters. Especially in the 21st century, countries discovered their mistakes and the sustainability issues gathered momentum. In the late 80s, a few companies from chemical and heavy industry sectors, voluntarily published sustainability reports in order to change public opinion. Furthermore, awareness of social responsibility grew rapidly and regulators started to require enterprises to involve environmental, social, ethical and human capital concerns into their reports. After the Brundlandt Report was released in October 1987, the concept of 'Sustainable development' became incrementally significant across the globe, this new concept was applied and discussed at a trans-

national, international, national, regional and community level. Sustainability and corporate social responsibility issues started to become an important component of supranational social policies.

In 1992, United Nations Conference on Environment and Development was held in Rio de Janeiro (Earth Summit). This conference resulted with the adoption of 27 principles of Rio Declaration and Agenda 21. Rio declaration defines 27 principles to ensure sustainable development through national and international contribution of the participant states. The declaration indicates that long term economic development can only be obtained with the involvement of responsible people and protection of the common environment. The first principle of the declaration states that people are at the center of sustainability and human beings are responsible for a healthy and productive life in harmony with nature.

As it is seen from this statement, human welfare is the primary goal and sustainable development can only be ensured with the involvement of a responsible society. Basically, sustainability is created and applied through three main components including economic, environmental and social indicators. Corporations may further subcategorize these main indicators considering their stakeholders so that they can utilize indicators that are related to climate change, energy, gender equality, health, natural resources, poverty, human resources management etc. Triple bottom line reporting is a lodestar in order to provide information to stakeholders other than shareholders on these issues. The Global Reporting Initiative provides criteria in order to measure performances of businesses for each leg of the Triple Bottom Line.

GRI was founded in Boston in 1997. It was developed by the Tellus Institute, United Nations Environment Programme (UNEP) and Coalition for Environmentally

Responsible Economies (CERES). In 2000, GRI launched the first version of the guidelines, representing the first global framework for comprehensive sustainable reporting. According to KPMG International Survey of Corporate Responsibility Reporting (2013): "Almost 80 percent of the largest 100 companies in 41 countries worldwide issuing corporate responsibility (CR) reports now use the Global Reporting Initiative's Sustainability Reporting Guidelines." In KPMG (2013) survey, sustainability reporting is found to be truly mainstream, with almost three quarters of the 4,100 companies surveyed producing CR reports, and 78 percent of these referring to the GRI Guidelines. The survey found that 93 percent of the world's largest 250 companies issue a CR report, of which 82 percent refer to the GRI Guidelines.

Banking sector, as the flagship of the financial industry, started to consider corporate social responsibility issues relatively later than other sectors. Banks as financial institutions accept deposits and grant loans. As it stands, banks are fostering production, manufacturing, energy and other sectors as well. In this context, accountability and transparency of banks became far more important because fragility of the banking sector affect real sector in a negative way. It is not long now before, predefined as too big to fail US banks have suffered unprecedented loss due to subprime mortgage crisis. Large financial institutions were saved from collapse through bailouts.

The global financial crisis began in 2007 with the largest US banks and spreaded worldwide. Downturn in economic activities remained in effect for a long time and showed itself in Europe as European sovereign debt crisis. Global crisis created more awareness on the importance of the banking industry among all stakeholders. Internal and external stakeholders put pressure on companies to report

not only on financial information but also the other components of triple bottom line reporting. Triple bottom line is a framework which examines the effects of business activities on 3 facets of sustainability: environment, social accountability and economy.

Turkish banking sector also has a great importance as in other countries. Banks are the most prominent components of Turkish financial system. Therefore, weakness or robustness in this sector is very important for every part of the society. Especially, after 1980s efforts in the transition to a liberal financial system in the absence of solid regulations caused troubles in banking industry. Banking system faced a major crisis in 1994 and then twin crises in 2000 and 2001 due to this unsolid base of transition. The crisis combined with other structural problems, led to very severe effects. 11 banks were seized between 1994-1999 periods. During this period, banks have invested intensely in treasury bills and worked with high foreign currency open positions. This excessive risk taking tendency caused a high depreciation in Turkish Lira.

Taskin, D (2015) reports in her study that in 2001 crisis, half of the total assets of the total banking system melt down due to the depreciation in Turkish Lira and some of the bankswere taken over by Savings Deposit and Insurance Fund.Kaytaz and Gul (2013) argues in their study that Turkey's deep economic and financial crisis in 2001 was the result of long-suffering policies and delayed structural reforms.In order to provide stability and trust, the new Central Bank Law and the Banking Law went into force and by the help of these regulations, political intervention was greatly reduced and a fair competitive environment could be established.

In December 1999, following the crisis in the 1990s, in order to stabilize Turkish economy which was having trouble with the chronic inflation, high real interest rates and progressively deteriorating debt dynamics, an exchange rate based stabilization program, which was supported by the international financial institutions was initiated (Serdengeçti, 2001).

In year 2000, the Turkish Government decided to remove the fragmented structure in the banking regulation and supervision, and to establish an independent body which will be the sole authority in banking sector. In order to improve the effectiveness of the regulation and the supervision in banking industry, Banking Regulation and Supervision Agency (BRSA) was established in June 1999 according to Banks Act Nr. 4389 and began to operate in August 2000. Regulations distorting the competitive equality among private banks and public banks were abolished and supervision authority became more powerful to take action in the case of any weaknesses of the financial structure of the banks.

Turkey initiated a structural reform program in 2001 in order to ensure more sustainable growth and build a robust financial foundation. The main components of the government's reform program that related to the development of the private sector, included a reliable investment environment; a compact and transparent, effective public sector; a healthier and competitive financial system; expedited privatizations; and a sound business infrastructure, with a special focus on communications and energy (Hoekman, B. and Togan S., 2005)

Turkish banking sector exacted a toll while adjusting banking sector but many of Turkish banks became comparable to their European counterparts. In terms of economic balances in 2002, high growth rates were achieved in production and national income. Chronic high inflation rates began to decrease with the

implementation of successful fiscal and monetary policies. In addition, the elections resulted in a single party government what made economic and political conditions more stable. After the recovery period, banking industry embarked on a process of rapid change.

Volatile and high profitable years lived short and market opportunities came to an end. Profit margins reduced and almost all banks were giving similar services, therefore the management of the banks searched for new ways for distinguishing them among their rivals. In order to sustain their profitabilities big banks saw that they should apply customer focused approach. 2008 global financial crisis showed the importance of effective risk management system once again. Furthermore, sustainability concept came to the fore. It was clear that banking industry could not maintain their activities in a world where they carried out activities in a vacuum.

In brief, Turkish banking sector is well regulated now. All banking businesses, transactions and services offered in the developed world countries are also provided by Turkish Banks. Asset size of banks in financial sector is increasing day by day. As of 2015, banking sector asset size shown in Table 1.

Table 1. Asset Size of Financial Sectors in Turkey

Asset Size of Financial Sectors in Turkey as of 2015/12 (billion TL)		
SECTOR	AMOUNT	Rate in Total (%)
Banks	2,357	81
Portfolio Management Companies	99	3
Unemployment Insurance Fund	93	3
Insurance Companies	96	3
Real Estate Investment Trusts	52	2
Other financial institutions	199	8
Total	2,585,591	100

Source: This table is taken from https://www.tbb.org.tr/Content/Upload/Dokuman/7378/Faaliyet_Raporu_2015.pdf

Welfare of people is tightly coupled with the banks' and other stakeholders' with which they are related. In order to continue their operations, banks should also consider the needs and demands of the stakeholders other than the shareholders. During this period, banks started to establish corporate value chain in harmony with their stakeholders. Corporate social responsibility activities started in line with the global standards. Banks that want to thrive in this direction began to publish sustainability reports.

In order to build and achieve a sustainable economy, we need more transparent, responsible, and sustainable companies. We hope that our research will raise awareness and improve implementation of sustainability reports in the whole financial sector as well as its tangents.

Institutions measure their sustainability performances using criteria set out within the Global Reporting Initiative Principles. Each institution publishes its sustainability reports annually. These reports provide various performance indicators of sustainability mainly on environmental, social and economic practices. Since there are various criteria to determine sustainability, we believed that multi-criteria decision-making methods can be used to compare sustainability performances of institutions. Analytic Hierarchy Process (AHP) is one of the most common multi-criteria decision making methods used. We decided to use AHP approach in our work.

Until now, application areas of AHP studies have been conducted mainly in the energy, infrastructure, urbanization, logistics, manufacturing and transportation sectors and mainly in the context of choosing the best option among alternatives. This thesis will focus on the sustainability performances of Turkish banks. Because, many economic, environmental and social data has begun to share in this sector, enough data has been generated to conduct performance analysis. The importance of the sector is quite important for the well being of the whole economy. This study is to first to employ the impact of expert participation on sustainability performance indicators in the banking sector in Turkey.

We hope that this study will encourage companies to become more transparent and disclose data about their sustainability performances. Consequently, this thesis will analyze the performances of four banks (Akbank, Garanti Bankasi, Is

Bankasi and Yapi Kredi Bankasi) regarding economic, environmental and social aspects in the Turkish banking sector and rank them according to their sustainability performances. Akbank, Garanti Bankasi, Is Bankasi and Yapi Kredi Bankasi are those banks that have realized that sustainability is a very important issue and that's why they adopted sustainability in corporate governance. Banks that are analysed in this study, use GRI reporting standards that have been acclaimed and that are used by many large companies in the world. These banks' sustainability reports are the pioneering feature of the Turkish Banking Sector, which include social, environmental and economic responsibility dimensions and their performance in those fields.

Based on expert judgement under multi criteria decision modelling, the research question of this thesis is "Which of these four leading banks is best in its sustainability practices?" The rest of the thesis is organized as follows: The second chapter presents the theoretical background of the study and the model on which the study is based. Chapters 3 and 4 describe the methodology and empirical dataand results, respectively. The fifth chapter presents the recommendations and concludes the thesis.

CHAPTER 2

LITERATURE REVIEW

Recently, due to the intense competition environment in the banking sector, banks had to be more customer oriented in order to have a large share of the market. As a matter of fact, the recent competitive environment made it necessary to determine the criteria affecting the customers' bank selection and concordantly banks had to improve their services according to these criteria. If a bank can gain the trust of its customers, this trust relationship will leave a positive impression on the customer for all future purchasing processes and decisions.

According to a survey -Edelman Trust Barometer, 2009 – during the recent years, social and environmental impact of companies created a global pressure on financial institutions to adopt and publish sustainability reports in order to disclose their transparency in terms of their effects on environment, natural resources and human capital. Sharing more data with respect to companies' environmental and social impacts will have a good reputation in the eyes of stakeholders. In parallel with that, Orlitzky et al. (2003) study provides encouraging data suggesting a positive link between Corporate Social Responsibility (CSR) and increased profits. Furthermore, several high-profile corporate scandals and the global financial crisis of 2008, made a negative impression and a general feeling of distrust regarding companies' ability to self-regulate. Edelman's trust and credibility surveys demonstrate the trust of stakeholders for each sector. Table 2 shows the results of the Edelman Trust Barometer (2016). The table shows that financial sector has realized the biggest increase in percentage in terms of customer trust criteria. This phenomenon happened by means of quick recovery of the financial services sector.

Demonstrating an eight-point increase in the last 5 years was not seen in any other sector. The sectors that followed the financial sector most closely are the energy and consumer packaged goods sector with 5 and 4 percentage increase respectively. While tech companies are at the top of the list in terms of overall score, they have suffered a 2-point decline in the last 5 years. Other sectors (food&beverage, telecommunications, automotive and pharmaceutical) included in the survey have not performed a significant change over the last five years.

Table 2. Sector Trends: Trust in Each Industry Sector, 2012 to 2016

Industry	2012	2013	2014	2015	2016	Change in 5 years
Financial Service	43	47	48	48	51	8
Energy	53	57	57	56	58	5
Consumer Packaged Goods	57	60	61	60	61	4

Source: This table is taken from http://www.edelman.com/insights/intellectual-property/2016-edelman-trust barometer/executive-summary/

In recent years, many academic studies have been carried out on Environmental, Social and Corporate Governance data (ESG) and CSR. The importance attributed to these subjects is quoted from the following studies. Ioannou and Serafeim (2014) report in their study that investors and information intermediaries in capital markets, such as investment advisors and analysts, increasingly involve ESG data in their valuation models and generate demand for sustainability reporting.

Eccles et al. (2011) argues the adoption and implementation of business practices involving initiatives that benefit society as well as the availability of Corporate Social Responsibility scores, has in fact created a growing interest by financial markets, and especially investment analysts.

Godfrey et al. (2009) summarized the field of CSR as the management of potential conflicts of interest between different stakeholders with respect to economic, environmental, social and ethical concerns.

Yu and Zhao (2015) state that conducting sustainability practices helps companies keep their positions in the market long term and provide better investment opportunities. Cheung et al. (2010) find firms undertaking social responsibility issues have higher firm value in Asian emerging markets.

Minna Yu and Ronald Zhao et al. (2015) presume that firms on the Dow Jones Sustainability Index (DJSI) have a higher market valuation than companies not involved in DJSI. Stakeholders such as regulators, executives, employees and civil society started to witness the popularity of companies in adopting CSR programs, and reconsider initiating publicly available CSR ratings and rankings provided by third parties. Classic performance measurement considering only financial performance methods began to change after these discussions.

Schaltegger et al. (2006) define corporate sustainability concept as a factual approach relating to the contextual integration of economic, environmental and social aspects. Elkington (1998) argues that these three dimensions are the components of the concept of the ‘triple bottom line’, which is utilized by organisations in order to see their impact on society. These three aspects constitutes triple bottom line reporting, visualize sustainability not just by drawing ecological, social and

economic objectives in a triangle but by also citing the interrelationships between these three aspects.

AHP and other MCDM models have been used in many sectors such as energy, infrastructure, urbanization, logistics, manufacturing and transportation. It is seen that the alternatives to be selected for evaluation are economic, environmental impact and social aspects. These issues are evaluated and the most appropriate alternative is identified.

Rebai et al. (2015) claims that corporate social responsibility concept promote the economic development of corporates while improving skills and competencies of employees and employee rights as well. Along with these benefits, adopting sustainability contribute environmental consciousness. Sustainability foster companies to use greener energy, encourage recycle and reduce wastes. Thoroughly responsible corporates improve the welfare of all society. In parallel with this concept, triple bottom line performance methods have been developed.
Indeed, there is no unique model for measuring corporates' sustainability performance. However, as the number of the sustainability criteria and indicators increase and it is challenging to assign specific weights to GRI criteria, scholars use multicriteria decision making models in order to evaluate sustainability performance. Various different applications of multi-criteria decision making models used in different business fields.

Ding et al. (2015) gave equal weights for their sustainability indicators in the Trinity of Cities' Sustainability from Spatial, Logical and Time Dimensions (TCS-SLTD) model for evaluating the sustainability of cities in developing countries. The TCS-SLTD model is a practical tool for determining the selection of sustainable

development indicators, and a conceptual framework for comprehensive sustainable development.

Zhou et al. (2015) commit entropy weights for their sustainability criteria in the selection and modeling sustainable urbanization indicators.

Kucukvar et al. (2014) proposed a fuzzy multi-criteria decision-making model, which is used for ranking the sustainability performance of pavement alternatives, constructed with hot-mix and warm-mix asphalt mixtures. Research consisted of four different techniques. First, they applied TOPSIS method to decide the best pavement alternative. Secondly, they used the intuitionistic fuzzy entropy method to define the significance of phases and criteria. Thirdly, they employed the intuitionistic fuzzy weighted geometric averaging operator to generate a sub-decision making matrix based on weights of attribute, and finally the intuitionistic fuzzy weighted arithmetic averaging operator to establish a super decision matrix based on weights of different life cycle phases. As a result of research findings, a synthetic wax-type warm-mix asphalt additive is picked as the best alternative among the pavement alternatives. Moreover, conventional hot-mix asphalt is ranked to be the second best alternative compared to other mixtures.

In their study, Stefanovic et al. (2016), compare the AHP and Analysis and Synthesis of Parameters under Information Deficiency method for evaluating the sustainable of waste management cases. The results demonstrate that there is no significant difference in the scenario ranking, regardless of the method used. The most sustainable waste management alternative is the scenario which involves composting of organic waste and recycling of inorganic waste (39.3% ranking priority).

Mulliner et al. (2016) applied and compared different multiple criteria decision making (MCDM) approaches such as weighted product model (WPM), the weighted sum model (WSM), the revised AHP, TOPSIS and COPRAS for the purpose of assessing sustainable housing affordability. They used 20 criteria and 10 alternative for applying their models. The feasibility of different MCDM methods for the focused decision problem was reviewed. They discussed the similarities in MCDM methods, assess their robustness and compare the resulting rankings in their paper.

De la Fuente et al. (2016) conducted sustainability analysis of different component materials for sewerage pipes by using MCDM method based on the value analysis and the MAUT. The paper advanced a method that minimizes the subjectivity in the process of determining the materials to construct sewerage pipelines. In line with this purpose, a tree is established to provide a sustainability index for each alternative. Value functions used and weights assigned to each criteria and indicators of this tree. These value functions were created by experts. Further, the weights were given by using AHP. The model is utilized to assess the sustainability of 8 alternatives.

Azizi et al. (2016) intended to define and rank the indices affecting sustainable development of Iran's wooden furniture industry by using AHP. After the analysis, they decided to work with 39 indicators and 7 criteria defined as technical, human, cultural-social, economic, materials and products, rules and regulations, and environmental. AHP was applied by distributing surveys among professional experts. Results demonstrate that the top three indices for adopting sustainable development in this industry respectively belong to sub-criteria of economic stability increase in

the country, development of furniture industrial clusters, adjustment of furniture and wooden products importation tariffs.

Egilmez et al. (2015) developed a four-step hierarchical fuzzy multi-criteria decision-making approach. 27 U.S. and Canada metropoles' sustainability performances assessed with a total of 16 sustainability indicators are used. After collecting data they conferred with experts from academia and related sectors. They took the expert judgements and based on these preferences quantified sustainability performance scores by using the collected data and obtained sustainability indicator weights. The results demonstrated that the average sustainability performance score is found to be 0.524 over scale between 0 and 1. The metropole with the highest performance score is found to be New York with 0.703 and the lowest performing city is identified as Cleveland with 0.394. The results of the statistical analysis also show that the greatest significant correlations are obtained with CO_2 emissions per person and share of workers traveling by public transport. Therefore, the CO_2 emissions and public transport are found to have the most prior impact on the sustainability performances.

CHAPTER 3

METHODOLOGY

3.1 Multi criteria decision analysis

Simply, decision-making is the act of choosing between two or more courses of action. Complex and difficult conditions of the problems compel researchers to search for new methods of solution. Sometimes people interact with problems that they do not know anything about. In such cases, experts' involvement could help in solving the problem and reaching an agreement for the optimum social utility benefit. For a long time, researchers have been interested in the analysis of how the human carries out this task. In this context, several techniques have been used so far; involving Multi-Criteria Decision Methods (MCDM). (Azapagic and Perdan, 2005a) posits that Multi-criteria decision analysis (MCDA) has been used to combine the three aspects of sustainability and utilize decision makers to prefer the best option when a wide range of alternatives has to be considered.

Ryu et al. (2009) claims that MCDM is interested in organizing and giving decision among multiple criteria. The goal is to support decision-makers having difficulties with problems. Usually, there is no peerless optimal solution for such problems and it is proper to use decision-maker’s choices to differentiate between solutions. The Multi Criteria Decision Analysis (MCDA) is a field of operational research and a quantitative method for assessing multiple and usually contradicting criteria when making a decision.

Lai et al. (2008) states that ordinarily, many approaches have been proposed for MCDA. Among them Multi-Attribute Value Theory (MAVT) is such a method in which all criteria are aggregated into a single value. Andrea De Monti et al. (2008)

contends that MCDA methods using a single-criterion approach are trying to convert the impacts concerning the different criteria into one criterion or attribute. Multi Criteria Decision method includes both Multi-Attribute Utility Theory (MAUT) and Multi-Attribute Value Theory (MAVT). In the same research, they also state that MAVT is the sub-methodology of MAUT. The two approaches cope with risk in different ways. On the one hand, MAUT relies upon a utility function, which compares the risky outcomes through the calculation of an expected utility. On the other hand, MAVT is unable to consider the risk of outcomes. Keeney and Raiffa (1976) state that the MAVT composes a value measurement model in which numerical scores are built in order to demonstrate the degree to which one alternative option may be preferred over another.

According to Mustajoki et al. (2011) and Karjalainen et al. (2013), the MAVT approach has been proven to provide a transparent and systematic framework to diagnose problems with multiple criteria and alternatives when dealing with stakeholders. Instead of using the more complex MAUT models in practice, Simple Multi-Attribute Rating Technique (SMART) was developed which is a simplified multi attribute rating approach. Analytic Hierarchy Process (AHP) model considers the interdependence that exists among different evaluation indicators in terms of priorities over a hierarchy according to values entered by experts of the process.

Saaty et al. (2008) believes that AHP has particular application in group decision making, and is used around the world in myriads of decision making, in fields such as government, business, industry, healthcare and education. Assari et al. (2012) argues that Technique for Order Preference by Similarity of Ideal Solution (TOPSIS) is based on the model that the preffered option should have the shortest

geometric distance from the positive ideal solution and the longest geometric distance from the negative ideal solution.

In this study, we analyze the different management alternatives of the banks by focusing on their triple bottom line performances and secondly, on evaluating the alternatives using the AHP method. We develop a performance evaluation model based on a multi-attribute utility approach aiming to assess the performance of a bank from different expert points of views in order to appraise the degree of sustainability of the bank. This developed framework is applied to four of the largest Turkish banks.

In addition, this work may offer an initial global measure of sustainability performance for banks. This study presents the ranking of banks' sustainability performances by using globally accepted sustainability criteria. Ranking of these banks may provide a benchmark for Borsa Istanbul companies which target high performance on corporate sustainability and may increase awareness, knowledge and practice on sustainability in Turkey.

3.2 Analytic hierarchy process

Decision-making has been inherently complex and it becomes more complex when many factors have to be weighed against competing priorities. Tools have been developed to assess, prioritize, rank, and evaluate decision choices. One of the most common tools is the Analytic Hierarchy Process (AHP) that is used for more than 30 years, had been developed by Thomas Saaty in 1971-1975 while at the Wharton School.

Analytic Hierarchy Process (AHP) is a method of measurement for organizing, formulating and analyzing decisions (M. Berrittella et.al 2007). Saaty

(1980) provided a theoretical foundation for the AHP that is an alternative ranking tool which can be used to solve complex and difficult decision problems with considering tangible and intangible aspects. Therefore, it helps decision makers to make decisions by using their experience, knowledge and intuition.

AHP procured a solution to rank the alternatives of a problem by deriving priorities. In that circumstance, Saaty, T. et.al (2007) sets the following question: what is the best combination of alternatives that has the largest sum of priorities and satisfies given constraints?

Saaty et.al (2002) offers AHP as a ratio scale method used to help people in decision making process. Complicated problems are organized hierarchically into criteria, subcriteria, and alternatives from which the decision is to be made. Experts or related people then express their preferences by determination on a variety of paired comparisons of both the criteria and the alternatives. The AHP assumes that people have significant preferences, however these preferences need not satisfy utility axioms. The final result is an ranking the alternatives in accord with the preferences

Saaty (1995) defines AHP as a method of separating a complex, unstructured situation into its constituent parts; lining up these variables, into a hierarchic order; assigning scores to subjective judgments on the relative importance of each variable; and analyzing judgments in order to determine which variables have the highest priority and should be acted upon to influence the result of the situation.

AHP is a model starting with a hierarchy of objectives. The top of the hierarchy formed the problem statement that is expected to be solved. At the next level, the major indicators are defined in broad terms. This is generally followed by a listing of the criteria for each of the indicators. Each criterion may then be separated into

individual parameters whose values are either estimated or determined by measurement or experimentation depends on the complexity of the established model. Alternatives for the underlying problem constitute the bottom level of the hierarchy (Shtub et al., 1994). .

AHP breaks down the established objective into elements or nodes, accordant with their common characteristics, and tiers, which refers to the common characteristic of the elements. The upmost tier is the "focus" of the problem or ultimate objective; in-between tier refers to criteria and sub-criteria, while the bottom tier contains the "decision alternatives". If each element of each tier builds upon the elements of the upper tier, then the hierarchy is complete; otherwise, it is defined as incomplete. The elements of each tier are compared pairwise with respect to a specific element in the immediate upper tier (Berrittella M. et.al, 2007).

In order to compare the indicators or elements, expert opinions may be collected in the form of questionnaires. Expert elicitation is a common application on the pairwise comparisons. When organizing an expert survey, it is important to choose the right people as the experts of the subject. They may be experts or may not be experts but at least it is expected that they are familiar with the problem. Saaty (1980)'s weight scale is used in pairwise comparisons in AHP applications. Table 3 shows the Fundamental Scale of Saaty.

Table 3. The Fundamental Scale of Saaty

Value	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored and its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is needed
Recip-rocals of above nonze-ro	If activity (a) has one of the above non-zero numbers assigned to it when compared with activity (b), then (b) has the reciprocal value when compared with (a)	A reasonable assumption
1.1 - 1.9	If the activities are very close	If it is difficult to assign the best value but when compared with other contrasting activities the size of the small numbers would not be too noticeable, yet they can still indicate the relative importance of the activities.

The AHP methodology is implemented on a hierarchical structure built for decision-making. AHP can be applied in many different fields of study that employ multi-criteria decision modelling.

AHP methodology uses a hierarchy, which is a structured tool for modeling the decision at hand. The structure primarily consists of a defined goal and the criteria in order to achieve this goal. Criteria can be divided into sub-criteria and these sub-criteria can be divided into sub-subcriteria according to the levels required in order to achieve the predefined goal. First, each criterion is weighted in its own horizontal level in the hierarchical structure. The importance weight of each criterion is expressed as a value between 0 and 1. In this way, the relative importance of each criterion among others is found. Next, sub-criteria under every criterion are weighted in a similar manner so that their priority weights are determined. Each group's total weight under every criterion (or sub criterion) should equal to 1 in itself.

Figure 1 shows a sample hierarchy that can be used in AHP methodology. In the top level of the hierarchy, the goal is defined. Then, the decision criteria that will be used in achieving the goal are set in the second level of the hierarchy. The hierarchy gets more detailed as there are more levels. There can be a third level where there are more subcriteria to define further each criterion. Figure 1 shows a hierarchy structure where the goal is set to choose the most sustainable bank. The hierarchy uses three criteria in determining sustainability: economic, environmental and social indicators. These criteria have different weights. Sum of their weights are equal to one. The economic indicators among others have the highest weight (0.45), which shows us that the decision makers put more emphasis on these indicators in determining sustainability. Then, there are subcriteria under each criterion. The sum

of their weights are again always equal to one. Finally, on the lowest level of the hierarchy, there are three alternative banks to analyze their sustainability.

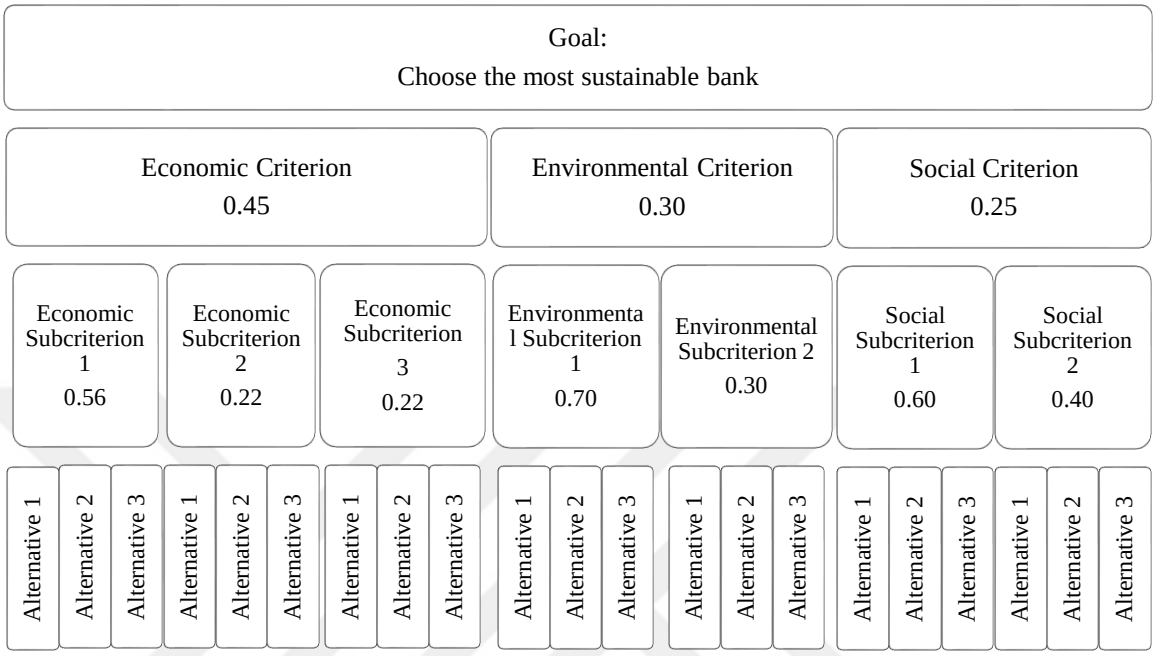


Figure 1. A sample hierarchy tree of the ahp methodology

3.3. A sample hypothetical ahp application case

In order to understand better, a simple application case of AHP model is given in the following example.

The goal in this simple minicase is to pick the best bicycle to purchase. We have three alternative bicycles to pick amongst and these three alternative bicycles will be evaluated on the basis of their durability, price, performance and design. In the design of this hierarchical decision modelling, we have 4 different criteria and three alternative bicycles. Our alternative bicycles have brands ‘A’,’ B’ and ‘C’. Preference criteria are durability, price, performance and design. Figure 2 shows the visualization of this hiearchy.

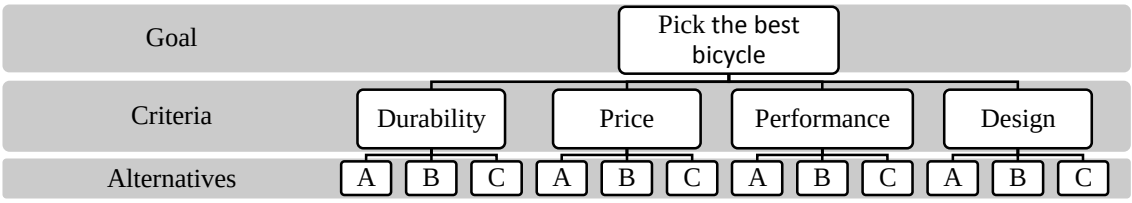


Figure 2. A simple ahp hierarchy

AHP methodology works with preference and priority matrices. Depending on the number of levels in the decision hierarchy, there are different numbers of matrix formations in the analysis. In our simple minicase, we have to determine the matrices explaining the priorities between alternatives and criteria and then the priorities between criteria and the decision goal.

Priorities of alternatives for each criterion:

The methodology employs building a preference matrix for every decision criterion. Hence, we need four preference matrices for durability, price, performance and design. These matrices should contain values that indicate the importance of each criterion for the decision makers.

Durability Preference Matrix, as shown in Table 4, demonstrates the decision maker's perception of durability for the three alternative bicycles in question. When the alternative bicycles are evaluated for their durability, A is perceived as a more durable bike than B and perceived to have the same durability as C.

Table 4. Durability Preference Matrix

Durability	A	B	C
A	1	4	1
B	1/4	1	1/5
C	1	5	1
Sum	9/4	10	11/5

Using the preference matrix above, priority weight matrices can easily be formed. First, we accumulate the values in each column to get the column sums. Then we divide these values by the sum of the same column. The new matrix as shown in Table 5 have a standard sum equal to 1 for each column. The last column on the weight matrix shows priority weights for each brand alternative. The priority weights are arithmetic means of each row on the weight matrix.

Table 5. Durability Weight Matrix

Durability	A	B	C	Priority Weight
A	1/(9/4) = 0.445	4/10 = 0.4	0.4545	0.4331
B	(1/4)/(9/4) = 0.11	1/10 = 0.1	0.0910	0.1004
C	1/(9/4) = 0.445	5/10= 0.5	0.4545	0.4665
Sum	1	1	1	1

As described above, preference and weight matrices are created for each criterion. Table 6, Table 7, Table 8, Table 9, Table 10 and Table 11 show the preference and weight matrices for the remaining three criterion: price, performance and design respectively.

Table 6. Price Preference Matrix

Price	A	B	C
A	1	6	1/4
B	1/6	1	1/8
C	4	8	1
Sum	31/6	15	11/8

Table 7. Price Weight Matrix

Price	A	B	C	Priority Weight
A	1/(31/6)=0.194	6/15=0.4	1/4/(11/8)=0.18	0.2585
B	1/6/(31/6)=0.032	1/15=0.067	1/8/(11/8)=0.09	0.0633
C	4/(31/6)=0.774	8/15= 0.533	1/(11/8)=0.73	0.6783
Sum	1	1	1	1

Table 8. Performance Preference Matrix

Performance	A	B	C
A	1	1/3	1
B	3	1	5
C	1	1/5	1
Sum	5	23/15	7

Table 9. Performance Weight Matrix

Performance	A	B	C	Priority Weight
A	1/5 = 0.20	(1/3)/(23/15) = 0.217	0.143	0.187
B	3/5 = 0.60	1/(23/15) = 0.652	0.714	0.655
C	1/5 = 0.20	(1/5)/ (23/15) = 0.131	0.143	0.158
Sum	1	1	1	1

Table 10. Design Preference Matrix

Design	A	B	C
A	1	1/3	1/2
B	3	1	3
C	2	1/3	1
Sum	6	5/3	9/2

Table 11. Design Weight Matrix

Design	A	B	C	Priority Weight
A	1/6 = 0.166	(1/3)/(5/3) = 0.20	0.111	0.159
B	3/6 = 0.50	1/(5/3) = 0.60	0.667	0.589
C	2/6 = 0.334	(1/3)/(5/3) = 0.20	0.222	0.252
Sum	1	1	1	1

After deriving the weight matrices of each decision criterion, the priority weights are used in formation of a new matrix: the alternatives priority matrix. Table 12 shows the priority weights of the alternatives where row means of each decision criterion are copied to a new column. This matrix shows the priority weights of each alternative brand bicycle for each decision criterion.

Table 12. Alternatives Priority Matrix

	Durability	Price	Performance	Design
A	0.433	0.259	0.187	0.159
B	0.100	0.063	0.655	0.589
C	0.467	0.678	0.158	0.252
Sum	1	1	1	1

The alternatives priority weight matrix above shows the priority of each bicycle brand on each of the decision criterion. We can read the following from the Alternative Priority Matrix above: C brand is best in terms of durability and price, B is best in terms of performance and design, A brand is the second in terms of durability, price and performance but the worst in design. Priority of each decision criterion on the goal:

In the next stage of analysis, a new matrix is created in order to determine the relative importance of the decision criteria on the decision goal at hand. As in the first stage, where the priorities of alternatives on each decision criterion were set, again we determine the preferences of decision criteria on the decision goal and afterwards we determine their priorities. Table 13 shows the preference matrix of criteria used in our minicase.

Table 13. Criteria Preference Matrix

Criterion	Durability	Price	Performance	Design
Durability	1.00	0.33	2.00	3.00
Price	3.00	1.00	4.00	6.00
Performance	0.50	0.25	1.00	2.00
Design	0.33	0.17	0.50	1.00
Sum	4.83	1.75	7.5	12

It can be inferred from this matrix that price is the most important criteria. It is followed by durability, performance and design respectively.

In the next step, criteria priority matrix as shown in Table 14, is prepared by dividing each cell in the criteria preference matrix by column totals so that each column total is one in the new priority matrix. Row averages give us the priority of each criterion on our decision goal. The criteria priority matrix above shows us that price has the highest priority (55.64%) in picking the best bicycle. Durability, performance and design have lower priorities on the decision goal.

Table 14. Criteria Priority Matrix

Criterion	Durability	Price	Performance	Design	Priority
Durability	0.207	0.19	0.267	0.25	22.85%
Price	0.621	0.57	0.533	0.5	55.64%
Performance	0.103	0.14	0.133	0.167	13.66%
Design	0.069	0.10	0.067	0.083	7.86%
Sum	1	1	1	1	1

In the final step, we have two matrices that are needed in determining the ideal bike. First one is the alternative priority matrix, and the other one is the criteria priority matrix. Alternative priority matrix shows the relative priority of each alternative for each decision criterion and Criteria priority matrix shows the relative importance of each criterion on bicycle selection. In order to choose the ideal bicycle, we need to multiply these two matrices. The matrix product of these two matrices gives us the final priority matrix as shown in Table 15.

Table 15. Final Priority Matrix

Criterion	Durability	Price	Performance	Design	Priority
A	0.0990	0.1438	0.0255	0.0125	28.08%
B	0.0229	0.0352	0.0895	0.0463	19.40%
C	0.1066	0.3773	0.0216	0.0198	52.52%

The matrix above helps us pick the best bicycle. As a result, the bicycle with the highest score among the alternatives will be preferred. According to the ranking obtained by Analytic Hierarchy Process, alternative "C", which has the highest priority (52.52%), will be selected as the best bike.

3.1.1.2 Application of ahp for our study

In our example the goal is “to find the most sustainable bank in Turkey”. R program's AHP package by Glur (2016) is used in performing the analysis. Figure 3 shows the hierarchy design used in the research question employed in this thesis. This hierarchy was written as a data tree in the R platform.

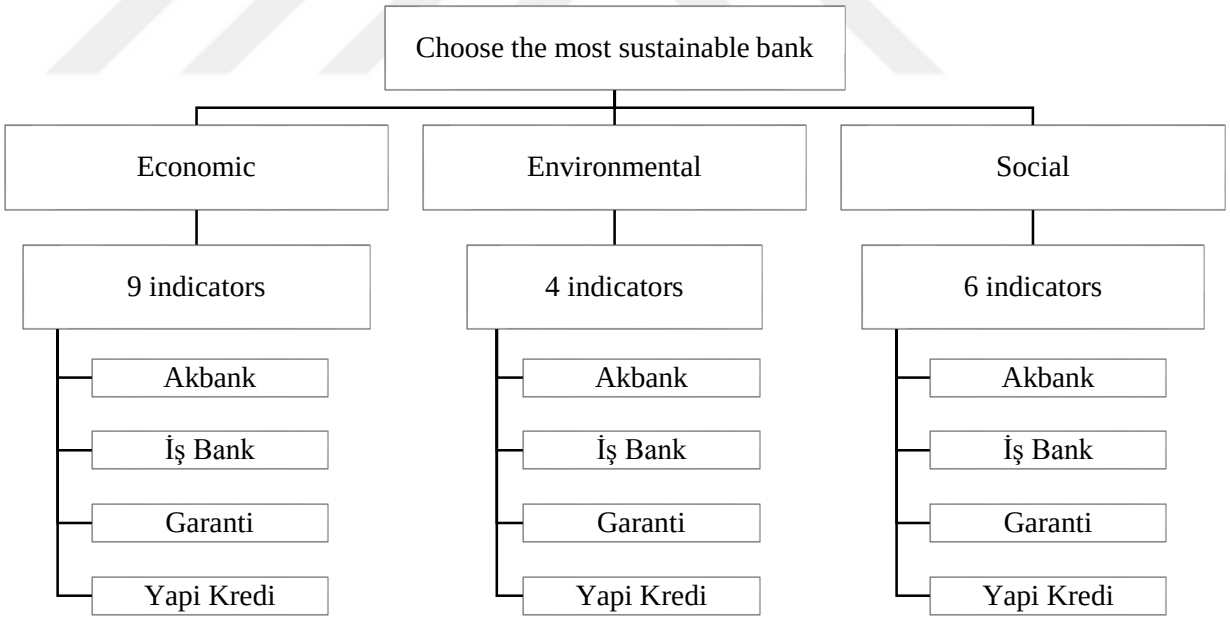


Figure 3. Hierarchy design of the research question in the thesis

In determining alternative bank priorities on each decision criteria, their three-year average sustainability performances were used.

Firstly, we installed four alternative banks to the package. After that we loaded three main criteria and 19 benchmark indicators selected from GRI implementation guidelines to the program. We have provided each bank's performance for the selected criteria from the sustainability reports of the banks involved in our study. We used each bank's last three years average performance for each criteria (2013, 2014, and 2015). Our goal is to find the "most sustainable bank" and we define this goal to the R as well.

In determining the preference structure of each criterion on the goal of choosing the most sustainable bank, a survey of expert judgement is used. Unlike the classical AHP model, the decision makers did not evaluate each criterion as pairs. Experts were asked to give a score of 1 to 5 by a questionnaire for each criterion and sub-criterion. Geometric averages were calculated for each criteria and sub criteria on the basis of scores given by experts.

Decision makers determined the relative weights of each criteria and each criterion was defined into the hierarchy the way it was specified by the experts. For example, experts has given the scores (geometric mean of 15 experts' scores) below for the main three criteria of economic, environmental and social indicators:

- Economic – 4.401
- Environmental – 3.80
- Social – 3.915

These scores were used in preference matrices with the following expression below:

Pairwise:

- [Economical, Environmental, 4.401/3.80]
- [Economical, Social, 4.401/3.915]

- [Environmental, Social, 3.80/3.915]

Table 16 shows the criteria preference matrix used in our study which is created by using the above-mentioned data.

Table 16. Criteria Preference Matrix for Banks

	Economical	Environmental	Social
Economical	1	4.401/3.8= 1.158	4.401/3.915= 1.124
Environmental	3.8/4.401= 0.863	1	3.8/3.915= 0.971
Social	3.915/4.401= 0.890	3.915/3.8= 1.030	1
Sum	2.753	3.188	3.095

Using the preference matrix above, priority weight matrices can easily be formed. First, we accumulate the values in each column to get the column sums. Then we divide these values by the sum of the same column. In the light of these of calculation we obtained criteria weight matrix as shown in Table 17. The new matrix have a standard sum equal to 1 for each column. The last column on the weight matrix shows priority weights for each criteria. The priority weights are arithmetic means of each row on the weight matrix.

Table 17. Criteria Weight Matrix for Banks

	Economic	Environmental	Social	Priority Weight
Economic	0.3632	0.3632	0.3632	36.32%
Environmental	0.3136	0.3136	0.3136	31.36%
Social	0.3232	0.3232	0.3232	32.31%
Sum	1	1	1	100.00%

As described above, preference and weight matrices are created for each criterion. Each criterion and sub-criterion was subjected to a pairwise comparison at its own level using the weights calculated by geometric mean. As a result, the bank with the best performance under the determined criteria was selected as the most sustainable bank.

15 experts answered our questionnaire and we have consolidated each score given for each criterion. Then we calculated the geometric means of these points as shown in Table 18.

Table 18. Expert Judgement

Judgement given by 15 experts for indicators	Geo Mean
Economic	4.401
Environmental	3.800
Social	3.915
Capital Adequacy Ratio	3.722
Non-performing Loans	3.974
Operating Margin	3.435
Return On Capital	4.272
Net Revenue Growth	4.111
Effective Tax Rate	3.450
Return On Asset	3.932
Return On Equity	4.008
Efficiency Ratio	3.280
GHG Intensity per Employee (tCO2e)	4.079
Energy Intensity per Employee (mwh)	3.810
Water Intensity per Employee (m^3)	3.939
Electricity Used Per Employee (kwh)	4.173
% Employee Turnover	3.308
% Women in Workforce	3.322
% Women in Management	3.259
Average Training Per Employee	4.486
Actual Net Income Per Employee	3.693
Actual personnel expenses per employee	3.504

We found the geometric mean of each indicator and consolidated indicators in the table above. As it is seen from the table above, there are three main aspects of sustainability on the top level. Then, there are nine indicators for the economic aspect, four indicators for the environmental aspect and six indicators for the social aspect weighted by 15 experts. After, we had the expert weights we have calculated their geometric mean for each aspect and indicator as well.

In order to calculate each bank's score for each criteria we have defined the preference functions to the R. Scores are determined by the function defined in the program for the relevant criterion. Since it is ideal for a bank to have low GHG emissions, the corresponding function is defined to the R as follows.

GHGIPE:

preferenceFunction:

function(a1, a2) min(9, max(1/9, a2$GHGIPE/a1$GHGIPE))

Since an employee received more training hours, it will be better for the institution and employee as well. We have defined the following function for this criterion.

ATPE:

preferenceFunction:

function(a1, a2) min(9, max(1/9, a1$ATPE/a2$ATPE))

Using the approach above, we treated higher and lower levels of indicator effects on sustainability appropriately. Thus, we were able to define correct

preference functions for each criterion. After we defined each criterion and function to the program, the program was asked to select the most sustainable bank in terms of the relevant data. The program automatically generates the matrices the way it is explained in bicycle minicase (Section 3.3) and analyzes each matrix in order to find the best alternative.

The methodology for evaluating the sustainability applied in this study involves five steps: definition of the goal and scope of the assessment; identification of sustainability issues and related indicators; life cycle sustainability assessment of different bank practices taking into account environmental, economic and social aspects; integration of these aspects using multi-criteria decision analysis; and policy recommendations.

CHAPTER 4

EMPIRICAL DATA AND RESULTS

4.1 Goal and scope definition

The goal of this study is to evaluate the sustainability of the Turkish banking sector by considering environmental, economic and social impacts of different practices currently present in human rights, working conditions, health, safety, governance, energy consumption and financial functions of Turkish banks. The findings will be used to identify the most sustainable banking practices for the country and make policy recommendations for improving the sustainability in the banking sector.

4.2 Sustainability issues and indicators

Sustainable development indicators translate sustainability issues into quantitative or qualitative measures of economic, environmental and social performance. Therefore, the identification of sustainability topics is a useful starting point in identification of sustainability indicators that will be used as decision criteria.

Belton and Stewart (2002) state that as part of sustainability decision-making, where there are often a wide range of sustainability topics and related indicators, the problem is to decrease the list of criteria to a reasonable number that can be analyzed by decision-makers. Generally, MCDA researches recommend that the number of criteria should not be more than ten. While converting the criteria into a smaller number of indicators the following should be taken into account:

• Value relevance: experts must be able to relate each indicator to the ‘upper level’ goals they are seeking to achieve and to represent their preferences in respect of these goals.

• Understandability: experts must have a common understanding of issues and indicators to be used in the decision-making process.

• Measurability: In order to define the priorities of indicators if it is possible, indicators should be measureable and quantifiable; however, in some instances indicators can be qualitative (e.g. ethical considerations) therefore proper MCDA modelling techniques have to be analyzed to deal with qualitative criteria.

• Non-redundancy: It is expected that each indicator refers and measures a different factor. By this way each indicator involved in the study, evaluated and contributed in terms of one factor. To avoid repetition, it is proper to combine similar indicators into a single indicator.

• Judgmental independence: indicators should be independent of each other, thus experts' preferences should not be affected by a preference made for another indicator.

• Balancing completeness and conciseness: it is important to gather all relevant issues and define related indicators; however, including too much detail may be challenging to manage therefore balancing these two conflicting issue requires decision analysis.

• Operationality: the amount of data and complexity of indicators should not result in excessive demand from decision-makers.

• Simplicity vs. complexity: indicators should define the sustainability issue in a simple way but this simplicity should be well arranged otherwise the issue might make it look as if it lost its importance.

MCDA begins with specifying the main sustainability indicators. Once the first step is completed, decision makers can focus on identifying the alternatives. It may be possible to change the order of these actions. For example alternatives can be identified before the identification of decision criteria. The decision making process

may be more effective if decision makers first understand which indicators and criteria are important and then designate their alternatives (Azapagic et al 2005).

The main sustainability issues and their related indicators are summarized in Table 20 (Environmental, economic and social issues and indicators) with a brief overview given below. As indicated in Table 19, the following environmental issues are considered: greenhouse gas emission, energy intensity, water intensity and electricity usage. These issues have been translated into four environmental indicators most commonly mentioned in GRI guidelines. Financial sustainability evaluated through nine economic indicators. Finally, six social issues pertinent to the banking sector in Turkey are evaluated. For all these issues, 19 relevant indicators have been formulated as shown in Table 19.

Table 19. Environmental, Economic and Social issues and indicators

Type	Abbreviation	Sustainability Indicator	Unit	Preferred Scale
Economic	NRG	Net Revenue Growth	Percentage	Larger
	OM	Operating Margin	Percentage	Larger
	ER	Efficiency Ratio	Percentage	Smaller
	NPL	Non-performing loans	Percentage	Smaller
	CAR	Capital Adequacy Ratio	Percentage	Larger
	ROC	Return On Capital	Percentage	Larger
	ETR	Effective Tax Rate	Percentage	Larger
	ROA	Return On Asset	Percentage	Larger
	ROE	Return On Common Equity	Percentage	Larger
Environment	GHGIPE	GHG Intensity per Employee	tonnes of CO_2 emission	Smaller
	EIPE	Energy Intensity per Employee	Megawatt hours	Smaller
	WIPE	Water Intensity per Employee	Cubic meters	Smaller
	EUPE	Electricity Used Per Employee	Kilowatt hours	Smaller
Social	ET	Employee Turnover	Percentage	Smaller
	WIW	Women in Workforce	Percentage	Larger
	WIM	Women in Management	percentage	Larger
	ATPE	Average Training Per Employee	Hours	Larger
	ANIPE	Actual Net Income Per Employee	Turkish Lira	Larger
	APEPE	Actual personnel expenses per employee	Turkish Lira	Smaller

The explanations for the indicators given in Table 19 are given below:

NRG: Net Revenue Growth is the annual growth in net revenue.It is not enough for an investor to know only the present revenue of a business. The revenue trend of the institution should be followed. For this reason, NRG rate is utilized. Calculated as: ((Net Revenue in Current Period - Net Revenue in Previous Period) / (Net Revenue in Previous Period)) * 100

OM: It is the amount remaining after deduction of operating expenses from gross profit and it is the result of the main activities of the institution. In other words, the operating margin ratio shows how much revenues are left over after all operating costs have been paid.

Calculated as: Operating Income/Net Income*100

ER: It shows how much of net interest income is spent on operating expenses. This measure generally used in the financial sector. The efficiency ratio compares costs against revenues. A lower percentage is better since that means high earnings and low expenses.

Calculated as: (Operating Expenses / ((Net Interest Income + Commissions & Fees Earned + Other Operating Income (Losses) + Trading Account Profits (Losses) + Gain/Loss on Investments/Loans + Other Income (Loss) - Commissions & Fees Paid) + Taxable Equivalent Adjustment or Net Revenue - Net of Commissions Paid) * 100

NPL: The non-performing loans, which constitute a leading indicator in terms of the general condition of the economy, show the solvency capability of individuals and institutions in the economy. The rate also shows the activity level of banks and risk appetite. The ability to estimate the rate on a healthy basis allows the economic units to manage their policies and the banks themselves effectively.

CAR: Metric is an international standard developed for ensuring control between banks' capital strengths and risks. It is the ratio of equity and risk weighted assets. Calculated as: Shareholders' Equity / ((Capital to be Employed to credit + market + operational risk)*12.5)*100

ROC: Metric shows how effective a company is turning capital into profits. Calculated as: ((T12 Net Income (Losses) + T12 Minority Interest + T12 Interest Expense * (1 - (T12 Effective Tax Rate / 100))) / Average of Total Capital) * 100

ETR: Metric shows total tax paid as a percentage of the institution's accounting income. Calculated as: Income Tax Expenses * 100 / Pretax Income

ROA: This ratio shows how effective the company uses its assets in generating profit. The greater the result of this calculation, the more likely that the company's assets have been used so successfully to generate profits.

Calculated as: (Trailing 12M Net Income / Average Total Assets) * 100

ROE: It shows how much profit the business partners have made from the capital they provided. The metric demonstrates how many unit profits are created for each unit capital. It is an important profitability and management performance indicator. Calculated as: (T12 Net Income Available for Common Shareholders / Average Total Common Equity) * 100

GHGIPE: Greenhouse gas (GHG) intensity shows GHG emissions emitted by per employee. Ratio is calculated based on items disclosed in bank sustainability reports. Calculated as: Total GHG Emissions / Number of Employees

EIPE: Energy intensity shows amount of energy consumed per employee. Ratio is calculated based on items disclosed in bank sustainability reports. Calculated as: Energy Consumption / Number of Employees

WIPE: Water intensity shows the amount of water consumed per employee. Ratio is calculated based on items disclosed in bank sustainability reports. Calculated as: Total Water Use / Number of Employees

EUPE: Amount of electricity used by per employee. Ratio is calculated based on items disclosed in bank sustainability reports. Calculated as: Electricity Consumption/Number of Employees

ET: Number of personnel that left the company within a given period expressed as a percentage of the average total number of personnel. High employee turnover may indicate unsatisfied employees and low wages or it caused to consider company as unsafe or unhealthy.

WIW: Metric shows the proportion of women working in the workplace to all employees. The place of women in working life contributes to the sustainability of institutions.

WIM: Metric shows the proportion of women working at manager positions to all people working at manager positions.

ATPE: Metric shows the yearly average training hours of the employees. It contributes mot only development of the institution but also it enables to have qualified employees for institutions.

ANIPE: The metric shows the relation of Net Income/Net Profit (Loss) to the Number of Employees.

Calculated as: (Net Income (Losses) * 1,000,000) / Number of Employees

APEPE: Personnel expenses divided by the number of employees.

Calculated as: Personal Expenses / Number of Employees

After we define each sustainability aspect and each indicator, we have completed our hierarchical decision tree. Figure 4 shows the flowchart of our methodology and the hierarchical tree.

Figure 4 explains the progress of our study. First, the goal of our study is determined. Later, factors affecting the sustainability of the banks are identified and we ensure that selected indicators are used in sustainability reports of all banks involved in the study. The relative weight of indicators is determined by a survey of experts in the academia and those working in the financial sector. Responses were processed in the AHP method and we have analyzed banks' sustainability performances. Then, we examined the results and we evaluated what could be done for the development of this study in the future.

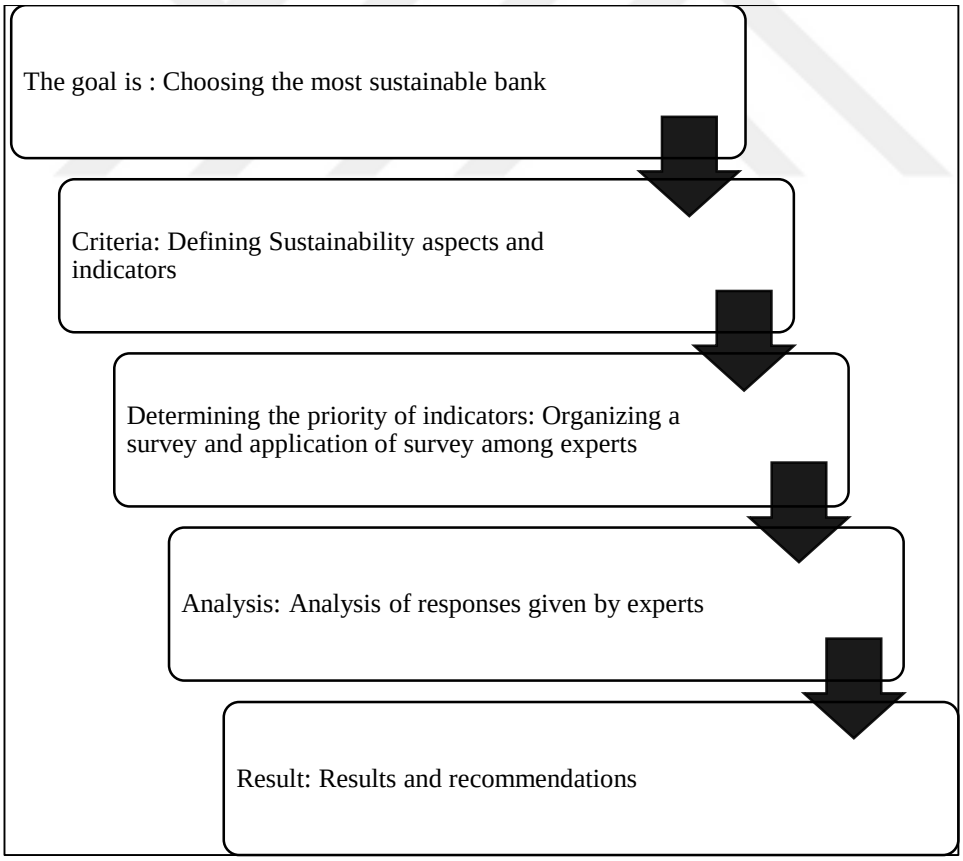


Figure 4. Flowchart of the methodology

Figure 5 shows the AHP data tree and it can be summarized such that the top of the data tree contains the goal of the study, then the main three sustainability indicators: economic, environmental and social indicators are the top three branches of the tree that reach the decision goal, and then spreads the subindicators for evaluating the banks involved in the study. There are different subcriteria under each sustainability topic (economic, social and environmental).

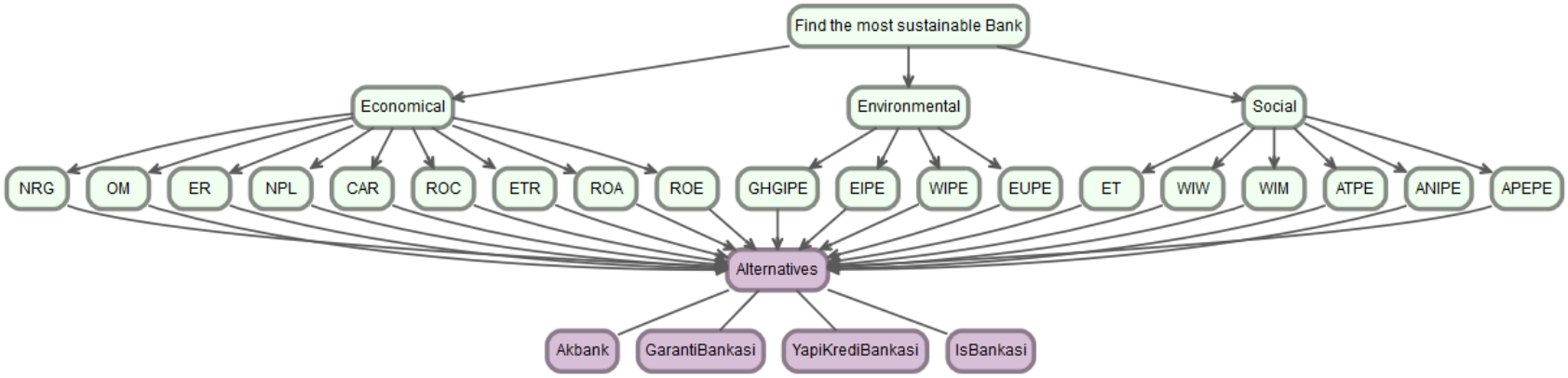


Figure 1. Visualization of Sustainability Data Tree

Priorities of indicators are determined based on experts' judgements for each indicator. Expert judgments are consolidated in order to set overall priorities of each indicator and all indicators' weights are checked in order to find if any inconsistency exists. Finally, we find the most sustainable bank predicated on the results of this process.

4.3 Inconsistency

Sometimes the judgements given by experts or the priorities given for each indicator may be inconsistent. AHP can deal with inconsistencies and improve the judgements. In order to measure consistency the derived priority scales are analyzed by multiplying them by the priority of their parent nodes and adding for all such nodes. Indeed, perfect consistency rarely occurs in practice. While using the AHP model, if pairwise comparisons in a judgment matrix has less than 10% consistency ratio (CR), the model can be considered as adequately consistent (Saaty, 1980).

Montis et al (2008) study states that in order to calculate the relative priorities among the *n* indicators considered, the 'principal eigenvector' of the matrix is first calculated. Then this eigenvector is normalized and the 'priority vector' is attained. The 'priority vector' expresses the priorities among the indicators belonging to the same node of the hierarchy. Each component of the vector represents the 'local priority' of an indicator (i.e. a node of the hierarchy) of the pairwise comparisons; the 'overall priority' of that indicator is the product of its local priority with the overall priority of the upper node. Indeed, the local priority of nodes at the first and second levels is equal to their overall priority. Therefore each indicator at each level has a weight (i.e. its overall priority) assigned to it. The composite weight for each of the indicator at the final level (i.e. the alternatives) is calculated by multiplying the

weights along each path of the hierarchy from the apex to the final element and adding the resultant weights from all paths to the indicator. The result is a vector of final weights for the alternatives under consideration: the higher its weight the better the alternative is.

While comparing indicators, inconsistency of a certain degree is allowable: in the AHP approach the 'principal eigenvalue' (λ_{max}) of each matrix of pairwise comparisons is calculated for assessing the degree of inconsistency. Calculation of inconsistency in an AHP model can be formulated as:

$CR = \frac{CI}{RI}$ where $CI = \frac{\lambda_{max}-n}{n-1}$ and in order to obtain Random Consistency Index (RI), Saaty (2008) provided average consistencies (RI values) of randomly generated matrices as shown in Table 20.

Table 1. Random Consistency Index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: This table is taken from http://people.revoledu.com/kardi/tutorial/AHP/Consistency.htm

Actually the consistency of a model is equivalent to its relation between principal eigenvalue (λ_{max}) and *n*; if the matrix is inconsistent λ_{max}>*n* and as it is mentioned before it is negligible as long as it does not exceed 10%.

4.4. Sustainability assessment: Data

We used different sources of information to attain the sustainability performance measurse of the banks involved in the study. In this study we primarily used the Bloomberg Limited Partnership (L.P.), statistical reports of The Banks Association of Turkey (TBB) and annual sustainability reports of the banks (2013,

2014, and 2015). Bloomberg L.P. is a data providing platform including financial data, analytics and equity trading platforms for its' worldwide users. Bloomberg L.P provides ESG (environmental, social, governance) scores on its own platform.

Bloomberg ESG score is a data disclosure score. For example, if a company does not disclose anything then the ESG score will show as N/A. The score ranges from 0.1 point for companies that disclose a minimum amount of ESG information to 100 points for those that disclose every data and indicator point collected by Bloomberg. Each data point is weighted in terms of significance, with data such as GHG emissions carrying greater weight than other disclosures. The score also differs among industry sectors. This way, each company is only assessed in terms of the data that is relevant to its industry sector. Bloomberg ESG disclosure scores of the four banks in our study are shown in Table 21.

Table 2. Bloomberg ESG Disclosure Scores of the Four Banks in Our Study

Banks	2013	2014	2015
T. Garanti Bankasi	55.26	58.77	57.89
Yapi Kredi Bankasi	49.56	48.68	50.88
Akbank	42.54	46.05	45.18
Is Bankasi	10.53	10.53	-

Source: Bloomberg Finance L.P.

As it is seen on the table above, T. Garanti Bankasi is the most data sharing bank among the four banks. Yapi Kredi Bankasi and Akbank ranked as the 2nd and 3rd bank respectively in terms of sustainability data sharing. Is Bankasi has the lowest ESG scores among the banks in our study. Moreover, 2015 ESG score of the

Is Bankasi is not available in the Bloomberg, in other words data shared by Is Bankasi is not scored. Actually, limited data disclosure of Is Bankasi adversely affected the number of indicators used in our study.

We have narrowed down the indicators in order to perform the study with four banks. Environmental data provided by the İs Bankasi covered only the Head Office buildings located in İstanbul. However, other three banks mostly disclosed the information about the whole organization (Head Offices, Region Offices, branches etc.). Akbank's water emission data in '2015 Akbank Sustainability Report' covered only its water consumption (m^3/year) for Akbank Sabanci Center, Akbank Banking Center (ABM) and Zincirlikuyu and Silivri service buildings. In order to make a meaningful sustainability comparison among the banks, we have optimized the environmental data by using the emission on per employee basis as an indicator.

GHG emissions of these banks in our study were extracted from their sustainability reports and we have calibrated the emission figures of the four banks in order to make them compliant with international standards. Energy figures collected and reported in international standards can be categorized into two main groups. The first is the direct consumption of energy obtained from different sources of energy. In this group, the main component is the natural gas used for heating purposes. Natural gas is used as the main fuel at banks. In addition; diesel, butane (LPG), coke (coal) and fuel oil are also used in branches and petrol and diesel consumed in company-owned or leased vehicles. The second is the electricity purchased by banks as an "indirect energy". Most of banks' total Scope 1 and 2 emissions were indirect emissions from purchased electricity. Banks are measuring their GHG emissions by using different units of measurement. In order to bring their emission calculations to the same unit of measurement, we have converted the emission intensities of banks

to kWh and mWh. For example Akbank is using gigajoules as energy consumption unit. We have converted one gigajoule as 277.778 kWh. Accordingly, natural gas consumption is calculated and billed within the framework of natural gas billing communique, which is published by Energy Market Regulatory (EPDK). Conversion coefficient of cubic meters to kilowatt-hours varies according to three factors. These factors are altitude (atmospheric pressure), the characteristics of the type of gas and gas mixture. According to the values specified in the communique of EPDK, the amount of energy obtained from 1 cubic meter of natural gas consumption is considered to be the standard value of 10.64 kWh.

We employed conversion of energy units that are provided in N. Packer (2011) article. In his study, Packer claims that human being obtain energy from the consumption of fossil fuels. He inspected fuel sources in terms of the amount of energy they involve per unit of purchased source and compared these sources. In our study we have extracted the gasoline and diesel energy consumption size from the Packer's list. In that list, values are given in Gross Calorific Value, which means the amount of heat generated during the fuel is burned. According to Packer's study 1 liter of gasoline released 9.4 kWh unit of energy and 1 liter of diesel fuel releases 11.1 kWh unit of energy.

The number of indicators identified in our study could be higher, but the detail of data shared by banks in their sustainability reports have restricted this number. While financial data are given in the same detail for all banks, data sharing of banks differs especially in terms of social and environmental data. The share of unionized workers, share of disabled in workforce, community spending, loss of working hours due to workplace accidents, maternity leave and maternity leave return rate, paper consumption rate, waste generation, recycling applications are

shared by some of the banks involved in our study. Since we carried out the study on data shared by all banks, the indicators mentioned above were not included in our study.

The Banks Association of Turkey (TBB) was established in 1958. TBB established as a public institution in accordant to Article 79 of the Banks Act. The main objective of the Association is to protect the rights and benefits of banks, to conduct researches for the development of the banking sector, improve functioning of banking profession. In order to provide fair competition environment in the sector TBB take measures and apply procedures of these decisions, in line with the principles of perfect competition environment. Furthermore, TBB follows regulations, principles and rules of banking. TBB collect bank statistics that are open to public and disclose these data with comprehensive analysis. In our study we make use of the selected ratios, asset, liability and income tables that are delivered to TBB. We used annual sustainability reports mainly for reconciling data provided by the public sources with the data of the individual banks' published reports on their websites.

Table 22 shows the ranking of the banks involved in our study in terms of their asset sizes together with other financials. The ranking shows Turkiye Is Bankasi as the largest local bank by assets, although it is less profitable than some of its peers. In 2015, Turkiye Is Bankasi earned $1.06 bn in profits, making it the third most profitable lender in the country. Garanti Bankasi is the second largest bank in asset size and the most profitable bank among private banks. Akbank and Yapi Kredi Bankasi ranked as the 3rd and 4th largest bank by assets respectively. In this study, we compared these 4 largest privately owned banks in Turkey in terms of their sustainability practices.

Table 3. Turkish Banks - Ranked by Total Assets

Banks (as of December 31, 2015 (US Dollars)	Total Assets	Total Loans and Receivables	Total Deposits	Total Shareholders' Equity	Net Income/ Loss
Is Bankasi A.S.	94,485	60,976	52,706	10,978	1,056
Garanti Bankasi A.S.	87,160	54,535	48,285	10,617	1,167
Akbank T.A.S.	80,466	48,581	47,614	9,146	1,026
Yapi ve Kredi Bankasi A.S.	75,518	50,985	43,490	7,911	638
Total	766,250	499,817	428,600	86,225	8,788

Source: This table is taken from https://www.tbb.org.tr/en/banks-and-banking-sector-information/statistical-reports/20

We have compiled brief information about these four banks we studied in the following sections.

4.4.1 Turkiye Is Bankasi

Is Bank was established in 1924 as Turkey's first private bank. The table below showed the performance of Turkiye Is Bankasi with respect to selected 19 indicators for the years 2013, 2014 and 2015.

Table 4. Turkiye Is Bankasi Sustainability Data

Indicators	2013	2014	2015
NRG	4.57	9.66	12.99
OM	28.76	29.103	25.57
ER	62.85	62.84	64.22
NPL	1.65	1.55	2.03
CAR	0.14	0.16	0.16
ROC	4.29	3.52	2.88
ETR	18.58	21.22	18.52
ROA	1.46	1.30	1.11
ROE	14.47	13.15	11.04
GHGIPE	3.51	3.44	4.28
EIPE	8.70	8.18	9.49
WIPE	NA	25.33	23.74
EUPE	6,108.51	5,979.86	6,435.58
ET	5.12	3.55	NA
WIW	50.9	51.1	51.13
WIM	40.8	40.7	NA
ATPE	22.8	28.2	24.6
APEPE	94,307.59	101,044.06	102,868.60
ANIPE	131,102.20	139,149.33	122,550.38

If we considered the Table 23 as a whole, it is seen that Is Bankasi demonstrated a good performance between 2013 and 2015. However, Bank's performance based on the criteria included in our study can be considered as average. In terms of economical criteria, we can say that Is Bankasi improved only net revenue growth and capital adequacy ratios between 2013 and 2015. On the other hand, Is Bankasi performed relatively low performance on following economical indicators: operating margin, efficiency ratio, non-performing loans, return on capital, effective tax rate, return on asset and return on equity.

In terms of environemental performance, Is Bankasi showed a good performance on water used by per employee. It is seen that Is Bankasi performed moderate on the following environmental indicators: green house gas emission, energy intensity and electricity used by per employee.

It is seen that Is Bankasi showed its' best performance on social indicators. Employee turnover is very low. Half of the Is Bank's work force is made up of women and 40% of managers are women. Is Bankasi performed moderate on the following social indicators: Average training, net income per employee and personal expenses per employee.

4.4.2 Garanti Bankasi

Established in 1946, Garanti Bank is Turkey's second largest private bank of Turkey. The table below showed the performance of Garanti Bankasi with respect to the selected 19 indicators for the years 2013, 2014 and 2015.

Table 24 shows that Garanti Bankasi has performed well and steadily over the years. Actually, in some years other banks' individual performance is better than Garanti Bankasi but we evaluated banks with their average performance between 2013 and 2015.

Garanti Bankasi improved its' sustainability practice mainly in environmental indicators. It consumed less water and electiricty year by year. Garanti Bank has been able to maintain reasonable levels of energy consumption and gas emission rates for the years between 2013 and 2015.

Table 5. Garanti Bankasi Sustainability Data

Indicators	2013	2014	2015
NRG	13.41	13.19	12.57
OM	39.04	37.89	34.44
ER	49.52	48.1	49.85
NPL	2.14	2.46	2.77
CAR	0.14	0.15	0.15
ROC	4.07	3.90	3.48
ETR	23.59	22.87	22.41
ROA	1.65	1.58	1.38
ROE	14.94	14.79	12.47
GHGIPE	4.18	3.47	3.87
EIPE	9.187	8.11	8.41
WIPE	17.79	20.015	13.71
EUPE	6,958.85	6,094.24	5,875.12
ET	18.66	12.58	11.23
WIW	57	57	57
WIM	31.32	28	30.66
ATPE	54	44	44
APEPE	120,432.75	118,534.77	130,346.49
ANIPE	178,090.05	192,892.49	181,845.47

According to the Table 24, social sustainability criteria draws attention as the area where Garanti Bank needs to put more effort. Garanti Bank's 57% of work force and 30% of management made up of women. Average training per employee is

around 48 hours yearly. When compared with other banks involved in our study, personnel expenses per employee is relatively high and net income generated by per employee is relatively low.

4.4.3 Akbank

Akbank was established as a privately-owned commercial bank in Adana in, 1948. The table below showed the performance of Akbank with respect to selected 19 indicators for the years 2013, 2014 and 2015.

Table 25 shows that Akbank's economical performance was better than its' performance in years 2014 and 2015. Akbank seems to perform worse every passing year in terms of environmental indicators. Akbank's social sustainability performance varies from indicator to indicator. Employee turnover indicator is the most critical indicator that Akbank needs to put more effort. Akbank's 52% of work force and 35% of management made up of women. Average training per employee is around 57 hours yearly. Last year, average training hours decreased by 15 hours. When compared with other banks involved in our study, Akbank'personnel expenses per employee and net income generated by per employee are relatively high.

Table 6. Akbank Sustainability Data

INDICATORS	2013	2014	2015
NRG	18.56	8.07	7.11
OM	42.70	41.24	38.68
ER	35.68	36.84	37.98
NPL	1.51	1.85	2.38
CAR	0.15	0.15	0.15
ROC	4.43	4.20	3.64
ETR	24.28	22.03	22.73
ROA	1.71	1.63	1.37
ROE	13.80	14.00	11.93
GHGIPE	3.57	3.01	3.64
EIPE	8.79	7.76	8.84
WIPE	18.70	18.08	19.40
EUPE	6,837.78	5,992.46	6,413.92
ET	10.45	9.98	16.82
WIW	51.8	51.1	53.8
WIM	35.5	35	34.33
ATPE	62.37	62.79	47.94
APEPE	87,590.87	91,142.84	119,029.25
ANIPE	189,376.39	207,214.90	229,847.47

.

4.4.4 Yapi Kredi Bankasi

Yapi Kredi, the fourth largest private bank in Turkey with over 85 billion of assets. The table below showed the performance of Yapi Kredi Bankasi with respect to selected 19 indicators for the years 2013, 2014 and 2015.

Table 26 shows that performance of the Yapi Kredi on economic indicators is at an average level. Yapi Kredi presented highest rate of revenue growth in 2015. Unfortunately, non-performing loan rates were relatively high in 2015. Bank's performance on environmental indicators remined almost same for the last three years. When we look at the social sustainability indicators of Yapi Kredi, we can see significant improvement has been achieved in employee turnover rate. 62% of the work force and 23% of the management is made up of women. 62% is the highest rate among the banks involved in our study. Average training per employee hours has been increasing year by year. Personnel expenses per employee and net income generated by per employee figures are relatively low. When we look at the table above we can say that Yapi Kredi improved its' performance in terms of social sustainability indicators. However, as we assessed banks' overall performance with taking average figures of 2013, 2014 and 2015, it is seen that Yapi Kredi need to put more effort on all sustainability criteria to become the most sustainable bank.

Table 7. Yapi Kredi Bankasi Sustainability Data

INDICATORS	2013	2014	2015
NRG	12.33	9.96	16.91
OM	35.18	28.43	23.04
ER	48.49	54.2	57.96
NPL	3.70	3.55	4.12
CAR	0.16	0.15	0.14
ROC	6.79	3.08	2.32
ETR	21.26	22.95	24.76
ROA	2.51	1.16	0.89
ROE	21.36	10.68	8.82
GHGIPE	3.84	3.44	3.82
EIPE	7.58	7.03	7.75
WIPE	26.14	22.67	23.18
EUPE	5,844.45	5,405.56	5,902.78
ET	14.96	12.28	7.32
WIW	60.23	62.29	62.55
WIM	19.14	26.6	23.2
ATPE	24.89	31.02	46.66
APEPE	92,864.12	92,300.21	107,292.19
ANIPE	233,306.89	110,932.07	104,516.65

4.5 Expert elicitation

We prepared a computer-based survey following Despic and Simonovic (2000) practice. In order to obtain the measures that are necessary for the aggregation we

used a decision matrix for each one of the nineteen indicators (sub-criteria) and three criteria (economic, environmetal and social aspects) of the aggregation tree. The survey defines a list of the possible scenarios with two pre-defined qualitative levels of the criteria – i.e. all the combinations of "best" and "worst" values.

The experts were asked to provide numerical valuations for each indicator in order to determine their relative importance. In our experiment, the chosen scale for evaluation is from 1 to 5 according to the preference of expert. This was done for all 19 aggregation nodes, by choosing a value between 1 and 5 for each row.

Participants that are from different back ground and profession were contacted and asked to fill the survey (see Appendix A and B) between the beginning of September 2016 and the end of October 2016. Before responding to the survey, respondents were also asked to fill in their titles and type of institution they work. At the initial stage of the questionnaire, we introduced the sustainability issues and subcategories of these issues to the experts. Overall, 15 experts participated in the questionnaire and fulfilled the survey as required. An overview of the expert pool used to collect the necessary data for the aggregation methodology as is shown in Table 27. Experts that took part in the survey have different backgrounds: 60% of the experts are affiliated to academia and the other 40% of the experts are affiliated to banking and finance organizations.

Table 8. Distribution of Experts

	Survey Sent	Survey Answered	Share in the Indicator Weighting
Academia	35	9	60%
Banking and Finance	22	6	40%

We have used Google Forms which enable one to build web-based surveys which is easy to distribute and allow worldwide participation, through providing secure online access to surveys. We have categorized the survey into two main parts.

In the first part, we provided the main sustainability issues and asked the experts to rank the importance of the three main sustainability issues by using 1 to 5 points scale. After this part, we demonstrated how the indicators are allocated within the tree. The experts were made aware about the allocation of indicators under the main categorizations. Importance of each indicator was assessed under the main categorization which it belonged. However, the importance weights of the main categories are also implicitly affecting the indicators' importance weights. Thus, indicators' overall importance are not only determined by their own weight within their subcategories but also by the weights given to the main categories they belong to. In order to obtain the aggregation of indicators, the answers collected from all experts had to be further processed to derive a set of "consensus" weights for all criteria. In order to combine the preferences of expert valuations, expressed in measures of different experts, we have compiled each weight given by the experts and took the geometric mean of their elicited measures.

Experts are chosen particularly from the banking industry and academia. This mitigates the bias that may potentially result from the selection of a sample of experts from the same area.

We have collected weights from 15 experts and in this way we have obtained 15 different weights for each criteria and indicator as well. After this stage, we have consolidated these 15 weights into only one weight for each indicator as a group decision-making process.

According to Saaty (2008) there are two important issues in group decision making. The first important issue is to aggregate each expert's judgements in a group into a single representative judgement. Second important issue is to establish a representative choice from individual choices. Combining judgements of several experts to obtain a single judgement is an important part of the AHP model. Saaty (2008) states that taking the geometric mean, not the frequently used arithmetic mean, is the proper method to obtain a single weight in a group to decide. If the experts that participated in the survey, do not wish to combine their judgements then combination can be made by using only final outcomes of each expert. If the experts have different priorities of importance, the weights they gave are raised to the power of their priorities and then the geometric mean is computed. In order to have a single weight by using the geometric mean we have listed each weight given by the experts and applied the formula below:

$$Geometric\ Mean = \sqrt[n]{a_1 a_2 a_3 a_4 \dots a_n}$$

where,

a_i = weight scale provided by expert i

n = number of experts surveyed in the study= 15

For the sample space we have 15 experts who gave weight for each indicator, so the data set includes a_1, a_2, ... , a_{15} for each indicator.

4.6 Pairwise comparison

Triantaphyllou et.al (1995) claims that one of the most important steps in many decision-making methods is the accurate estimation of the data. This problem is not limited to the AHP method. It is also vital in many other methods which require

qualitative information from the decision-makers. Frequently qualitative data cannot be known in terms of certain values. For instance, if the questions are asked in virtual and sensorial forms, it is very challenging, if not impossible, to quantify them correctly. Thus, many decision-making models attempt to determine the relative weight, or value, of the alternatives in terms of the other indicators involved in a given decision-making problem. In order to overcome these problems, Saaty (1980) developed a method and started to use pairwise comparisons in order to determine the relative importance of each alternative in terms of the other indicators.

Generally, the expert has to select his or her answer among 10-20 discrete alternatives. Each alternative is involving a linguistic phrase. Some examples of such linguistic phrases are given in the Saaty's scale of relative importance table. The challenging part of the pairwise comparisons is determining linguistic choices of weights selected by the experts during their evaluation. Pairwise comparisons require converting qualitative expressions into some numbers such as ratios defined in Saaty's scale. Aforementioned scale is utilized for comparing each indicator with one another and provides the priority of all indicators by ranking them among their peers. Other comparison scales have also been generated and used by other researchers. For example, Triantaphyllou et al. (1994) reported and reviewed 78 different scales in his study. It is impossible for decision makers to make choices from an infinite data set. Miller (1956) in his Magical Number Seven research which is one of the most important and related experiment about individual responses have also shown that an average person cannot simultaneously compare more than seven objects (+ 2 or - 2). This study form the basis of Saaty's comparison scale as 9 the upper limit of his scale, 1 as the lower limit and a unit difference between successive scale values. In our study we have used 5 as the upper limit and 1 as the lower limit.

4.7 Results

Actually, in our study scores given by the experts were very close values of importance. Therefore, we analyzed the indicators and alternatives (four banks) in two different ways.

- First, we used equal weights for all aspects and indicators.
- Second, we used actual scores given by the experts

The results of these applications are shown below:

4.7.1 Sustainability ranking of banks by using equal weights for indicators

In our data tree we have given equal weights for each sustainability aspects and assign the same importance for indicators under each aspect. The results are shown in Table 28.

Table 9. Sustainability Ranking Of Banks by Using Equal Weights

	Weight	Akbank	Garanti Bankasi	Is Bankasi	Yapi Kredi Bankasi	Inconsistency
Sustainability	100%	26.8%	25.2%	24.5%	23.5%	0.0%
Economic	33.3%	9.1%	8.6%	7.7%	8.0%	0.0%
CAR	3.7%	0.9%	0.9%	0.9%	0.9%	0.0%
NRG	3.7%	0.9%	1.0%	0.7%	1.0%	0.0%
OM	3.7%	1.1%	1.0%	0.8%	0.8%	0.0%
ER	3.7%	1.2%	0.9%	0.7%	0.8%	0.0%
ROC	3.7%	1.0%	0.9%	0.8%	1.0%	0.0%
ETR	3.7%	1.0%	1.0%	0.8%	1.0%	0.0%
ROA	3.7%	1.0%	1.0%	0.8%	1.0%	0.0%
ROE	3.7%	0.9%	1.0%	0.9%	0.9%	0.0%
NPL	3.7%	1.1%	0.9%	1.2%	0.6%	0.0%
Social	33.3%	9.2%	8.1%	9.0%	7.1%	0.0%
ET	5.6%	1.0%	0.8%	2.7%	1.0%	0.0%
WIM	5.6%	1.5%	1.3%	1.8%	1.0%	0.0%
ATPE	5.6%	1.9%	1.6%	0.9%	1.2%	0.0%
ANIPE	5.6%	1.8%	1.6%	0.8%	1.3%	0.0%
APEPE	5.6%	1.5%	1.2%	1.5%	1.5%	0.0%
WIW	5.6%	1.4%	1.6%	1.4%	1.1%	0.0%
Environmental	33.3%	8.6%	8.5%	7.8%	8.4%	0.0%
GHGIPE	8.3%	2.2%	2.0%	2.0%	2.1%	0.0%
EIPE	8.3%	2.0%	2.0%	2.0%	2.3%	0.0%
WIPE	8.3%	2.3%	2.5%	1.8%	1.8%	0.0%
EUPE	8.3%	2.0%	2.0%	2.1%	2.2%	0.0%

As it is seen in Table 24, analysis of the economic performances of banks involved in our study shows that the highest ratios belong to Akbank and Garanti Bankasi, respectively. The lowest economic performance, on the other hand, belong to Is Bankasi and Yapı Kredi Bank. Analysis of social performances of the banks shows that the best performance belongs to Akbank. When ratios of environmental performances of the banks are analyzed, the highest performance is observed in Akbank. The successful performance of the Akbank on each criteria has made it the leader of total sustainability performance ranking.

Table 28 shows that for all the preferences considered, Akbank is the most sustainable bank with 26.8 points in overall assessment followed by Garanti Bankasi with 25.2 points. Is Bankasi and Yapi Kredi Bankasi has taken the third and fourth places with 24.5 and 23.5 points, respectively. When we analyzed each sustainability dimension independently, we saw that Akbank is the most sustainable bank in all sustainability aspects. Garanti Bankasi took the second place in terms of economical and environmental dimensions. Is Bankasi has taken second place in terms of social criteria performance.

4.7.2 Sustainability ranking of banks by using expert weights for indicators

We have performed our analysis through using original weights during pairwise comparisons. Since the experts gave close scores for each dimension, priority of dimensions slightly differs from the equal weighting case. Although changes in the importance of dimensions were very small, these differences affect both the points gathered by banks. Table 29 shows the sustainability ranking of banks by using expert weights.

Table 10. Sustainability Ranking of Banks by Using Expert Weights

	Weight	Akbank	Garanti Bankasi	Is Bankasi	Yapi Kredi Bankasi	Inconsistency
Sustainability	100%	26.9%	25.3%	24.2%	23.5%	0.0%
Economic	36.3%	9.8%	9.3%	8.4%	8.7%	0.0%
ROC	4.5%	1.2%	1.1%	1.0%	1.2%	0.0%
NRG	4.4%	1.1%	1.2%	0.9%	1.2%	0.0%
ROE	4.3%	1.0%	1.1%	1.0%	1.1%	0.0%
NPL	4.2%	1.3%	1.0%	1.4%	0.6%	0.0%
ROA	4.2%	1.1%	1.1%	0.9%	1.1%	0.0%
CAR	4.0%	1.0%	1.0%	1.0%	1.0%	0.0%
ETR	3.7%	1.0%	1.0%	0.8%	1.0%	0.0%
OM	3.7%	1.1%	1.0%	0.8%	0.8%	0.0%
ER	3.5%	1.2%	0.9%	0.7%	0.8%	0.0%
Social	32.3%	9.0%	8.0%	8.4%	6.9%	0.0%
ATPE	6.7%	2.4%	1.9%	1.0%	1.4%	0.0%
ANIPE	5.5%	1.8%	1.6%	0.8%	1.3%	0.0%
APEPE	5.2%	1.4%	1.1%	1.4%	1.4%	0.0%
WIW	5.0%	1.3%	1.4%	1.3%	1.0%	0.0%
ET	5.0%	0.9%	0.7%	2.4%	0.9%	0.0%
WIM	4.9%	1.3%	1.1%	1.5%	0.9%	0.0%
Environmental	31.4%	8.1%	8.0%	7.4%	7.9%	0.0%
EUPE	8.2%	2.0%	2.0%	2.0%	2.2%	0.0%
GHGIPE	8.0%	2.1%	1.9%	2.0%	2.0%	0.0%
WIPE	7.7%	2.1%	2.3%	1.6%	1.7%	0.0%
EIPE	7.5%	1.8%	1.8%	1.8%	2.1%	0.0%

Experts' votes demonstrated that the economic dimension is the most important criteria for maintaining the sustainability of banks. Social dimension outweighed the environmental dimension by a narrow margin. Still, Akbank was able to keep its leadership with 26.9 points. Garanti has taken the second place with 25.3 points. Is Bankasi gathered 24.2 points and pushed Yapi Kredi to the backseat by a 0.7% point. If we analyzed each dimension independently, Akbank is leading in all dimensions.

Indeed, the performances on economic criteria for banks are very close to each other. Analysis of the economic criteria performances show that the highest score belongs to Akbank with 9.8. Garanti gets the second place with 9.3. Yapi Kredi and Is Bankasi collect 8.7 and 8.4 points respectively. Akbank gathered 9.0 points in terms of social criteria. Akbank scored 0.6 points more than Is Bankasi. Garanti and Yapi Kredi gathered 8.0 and 6.9 points respectively. Actually, Table 29 shows that Yapi Kredi Bank's weakest performance seen in social dimension.

Environmental performance of each bank is very close to each other. Although Akbank could not show the obvious superiority on environmental criteria as in the other two main criteria, it still has the highest score on the basis of this criterion. Akbank collected 8.1 points. Garanti Bankasi followed Akbank with 8.0 points. Yapi Kredi Bankasi and Is Bankasi gathered 7.9 points and 7.4 points respectively.

CHAPTER 5

CONCLUSION AND IMPLICATIONS

Although, Turkey is a country that fell behind the developed countries in terms of economic, social and environmental global sustainability indices (according to the World Economic Forum's GCI scores by sustainability indicators for 2014-2015 Turkey ranks 45th) , each passing day the number of corporations adopting the sustainability concept is increasing in Turkey. Continuously, shareholders are demanding profitability, reliability and stability from corporations. Sustainability requires good corporate governance principles in order to steer the company in its applications of sound business strategies considering natural environment and social responsibilities. Banks as the flagship of the economy, they contribute to the development of all industries with an adoption and application of their social responsibilities. As more and more investors begin questioning the social and environmental sensitivity of the institutions they invest in, those banks that adopt sustainability practices will have competitive advantage over the other banks. Money earned from the investment is no longer the sole investment criteria. Social and environmental performances of corporations are the new considerations in investment decision criteria.

Like other sectors, banks should also carry out their business practices in a balanced manner in order to maintain their existence in the long term. This balance should be achieved within the framework of the sustainability triangle which is formed by social, environmental and economic aspects of sustainability.

As companies began to measure their environmental, social and financial performances and disclose this information to the public, it became easier and more

convenient to create a sustainability index. Encouraging companies to participate in the list will benefit both the markets and the whole community. In this study, we used AHP method to assess the banks' triple bottom line performance.

Today, with the emergence of the responsible investment concept, the funds have begun to invest more to the companies in the sustainability indices. If companies are involved in a sustainability index, this will attract responsible investors and it will create a competitive advantage for the listed companies. Social and environmental efforts of the companies can be evaluated by all stakeholders within the transparency principle, which will increase the reputation and market recognition of the companies involved in the sustainability index. What is more, as companies try to balance their triple bottom line performance, they advance the technology they use and produce greener products, so that the natural resources can be maintained for future generations.

When we rank the banks' three-year average performances according to their sustainability disclosures, Akbank ranks first, followed by Garanti Bankasi, Is Bank and Yapi Kredi respectively.

Akbank took the top spot with the highest sustainability score in overall sustainability performance. Although Garanti Bank and Akbank are close to each other in terms of their overall sustainability performance, Akbank's higher performance in social sustainability indicators carried it to the top of the list.

The results of the study show that the ranking in terms of economic dimension is not enough to determine the banks overall sustainability performance because environmental and social sustainability dimensions' impact is as important as economic dimensions' impact to determine the most sustainable bank. As it is

seen in the Table 28 and 29 social criteria play a crucial role to determine the most sustainable bank.

Banks started to measure, track and reduce the GHG resulting from electricity, gas and fuel use in buildings and from fuels used in employees' business, commuting and training travels. The banks subject to the study monitor and report on energy consumption and GHG emissions by sustainability reports. In order to reduce emissions derived from both their own operations and their customers, they use greener products and encourage loan customers to use greener products and services to reduce their CO_2 emissions. They also support renewable energy projects through given loans. When the sustainability reports of these banks are analyzed, it is obviously seen that they are taking some steps to decrease this waste generation by raising awareness among employees. Moreover, after adopting GRI and preparing their sustainability reports, banks recycled most of their waste and tried to use greener products for reducing the amount of waste they generated.

These banks aim to provide equal opportunity and do not differentiate people on the basis of their gender, religion or social origin. In addition to this, they support women for their participation in the workforce within their companies.

Banks as the drivers of Turkish economy, should foster the sustainable development of the whole country. In this thesis, we have evaluated sustainability performances of four banks with AHP method. Once all banks start to publish their sustainability reports and report more indicators in further years, it will be possible to make more detailed and analytical comparisons among banks. Also each bank's performance in sustainability indicators can be compared across years historically. This study can be improved with a mixed analysis involving other sectors and can encourage many companies to prepare sustainability reports and invest in

sustainability practices. The study may also include indicators for good corporate governance which is an important pillar in sustainability of corporations.

We hope that as a result of this work, we will be a prelude to sustainability studies and contribute to building a healthier future without consuming the resources of future generations.

APPENDIX A

SURVEY (ENGLISH)

Dear Respondent,

This survey is prepared for a thesis study in Boğaziçi University International Trade Management Master's Program. This survey will be used for academic purposes only.

The following survey will enable us to evaluate our country's banks in terms of economic, environmental and social topics. Indicators will be evaluated as the subset of each sustainability topic. The specific indicators (sub-criteria) of economic, social and environmental performances will also be weighed to determine their individual impact to overall sustainability performance. In this manner, we aim to determine the relative importance of each indicator and sub-indicator.

All your answers will be kept confidential. Thank you for your valuable contribution and your time.

PART 1

Could you specify your professional work area?

( ) Academical personnel

( ) Banking and Finance

PART 2

Sustainability grading scale will be evaluated between 1 point (least important) and 5 points (very important) according to their importance level.

Please indicate the importance of sustainability aspects below, considering their impact on sustainability process:

	1	2	3	4	5
Economical					
Environmental					
Social					

Indicate the importance of economic indicators

	1	2	3	4	5
Capital Adequacy Ratio					
Loans under follow-up (gross) / Total Loans and Receivables %					
Operating Margin					
Return On Capital					
Net Revenue - 1 Yr Growth					
Effective Tax Rate					
ROA					
ROE					
Efficiency Ratio					

Indicate the importance of environmental indicators

	1	2	3	4	5
GHG Intensity per Employee (tCO2e)					
Energy Intensity per Employee (mwh)					
Water Intensity per Employee meter cube					
Electricity Used Per Employee (kwh)					

Indicate the importance of social indicators

	1	2	3	4	5
% Employee Turnover					
% Women in Workforce					
% Women in Management					
Average Training Per Employee					
Actual Net Income Per Employee					
Actual personnel expenses per employee					

APPENDIX B

SURVEY (TURKISH)

Sayın İlgili,

Bu anket, Boğaziçi Üniversitesi Uluslararası Ticaret Yönetimi Yüksek Lisans Programı'nda tez çalışması için hazırlanmıştır. Bu anket sadece akademik amaçlı kullanılacaktır.

Aşağıdaki anket, ülkemizin bankalarını ekonomik, çevresel ve sosyal konular açısından değerlendirmemizi sağlayacaktır. Göstergeler, her bir sürdürülebilirlik başlığının alt kümesi olarak kategorize edilmiştir ve ilgili başlık altında değerlendirilecektir. Ekonomik, sosyal ve çevresel ana başlıkları altındaki göstergeler, sürdürülebilirlik performansı üzerindeki bireysel etkilerini belirlemek için tarafınızca ağırlıklandırılacaktır. Böylelikle, her göstergenin ve alt göstergenin nispi önemini belirlemeyi amaçlıyoruz.

Tüm cevaplarınız gizli tutulacaktır. Değerli katkılarınız ve zamanınız için teşekkür ederiz.

Profesyonel çalışma alanınızı belirtir misiniz? *

o [ ] Akademik Personel

o [ ] Bankacılık ve Finans

Sürdürülebilirlik notlandırma ölçeği aşağıda belirtildiği üzere önem derecesine göre 1 puan (en az derecede önemli) ile 5 puan (çok önemli) arasında değerlendirilecektir. *

	1	2	3	4	5	
Önemsiz	( )	( )	( )	( )	( )	Aşırı önemli

Aşağıda yer alan 3 ana sürdürülebilirlik konu başlığının bankaların sürdürülebilirlikleri hususundaki önemlerini değerlendiriniz *

	1	2	3	4	5
Ekonomik	( )	( )	( )	( )	( )
Çevresel	( )	( )	( )	( )	( )
Sosyal	( )	( )	( )	( )	( )

Ekonomik indikatörlerin önem derecelerini belirtiniz *

	1	2	3	4	5
Aktif karlılığı	( )	( )	( )	( )	( )
Takipteki kredi oranı	( )	( )	( )	( )	( )
Özkaynak karlılığı	( )	( )	( )	( )	( )
Sermaye karlılığı	( )	( )	( )	( )	( )
Efektif vergi oranı	( )	( )	( )	( )	( )
Sermaye yeterlilik oranı	( )	( )	( )	( )	( )
Faaliyet karı	( )	( )	( )	( )	( )
Yıllık Gelir Artış Oranı	( )	( )	( )	( )	( )
Yapılan harcamaların gelire oranı	( )	( )	( )	( )	( )

Çevresel İndikatörlerin önem derecelerini belirtiniz *

	1	2	3	4	5
Kişi Başı Sera Gazı Emisyonu	( )	( )	( )	( )	( )
Kişi Başı Enerji Tüketimi	( )	( )	( )	( )	( )
Kişi Başı Su Tüketimi	( )	( )	( )	( )	( )
Kişi Başı Elektrik Tüketimi	( )	( )	( )	( )	( )

Sosyal İndikatörlerin önem derecelerini belirtiniz *

	1	2	3	4	5
Personel Devir Hızı	( )	( )	( )	( )	( )
Kadın Çalışan Oranının yüksek olması ne kadar önemlidir?	( )	( )	( )	( )	( )
Kadın Yönetici Oranının yüksek olmasının önemi nedir?	( )	( )	( )	( )	( )
Çalışan başına verilen eğitim süresinin uzunluğu ne kadar önemlidir?	( )	( )	( )	( )	( )
Çalışan başına net gelirin yüksek olması ne kadar önemlidir?	( )	( )	( )	( )	( )
Çalışan başına personel giderlerinin yüksek olması ne kadar önemlidir?	( )	( )	( )	( )	( )

REFERENCES

Assari, A., Mahesh, T., Assari, E. (2012). Role of public participation in sustainability of historical city: Usage of TOPSIS method. Indian Journal of Science and Technology, 5(3), 2289-2294.

Azapagic, A., Perdan, S. (2005). An integrated sustainability decision-support framework Part II: Problem analysis. *International Journal of Sustainable Development & World Ecology,* 12, 112-131.

Azizi M., Mohebbi N., & De Felice F. (2016). Evaluation of sustainable development of wooden furniture industry using multi criteria decision making method. *Agriculture and Agricultural Science Procedia*, 8, 387-394.

Banking Regulation and Supervision Agency of Turkey. (2016). *Information Booklet*. Retrieved from http://www.bddk.org.tr/WebSitesi/english/About_Us/About_BRSA/5804brsa_booklet_feb2016.pdf

Banks Association of Turkey. (2016). 2015-2016 Annual Report. Retrieved from https://www.tbb.org.tr/Content/Upload/Dokuman/7378/Faaliyet_Raporu_2015.pdf

Belton, V., & Stewart, T. J. (2002). *Multiple criteria decision analysis: An integrated Approach*. Dordrecht, Netherlands: Kluwer Academic Publishers.

Berrittella, M., Certa, A., Enea, M. & Zito, P. (2007). An analytic hierarchy process for the evaluation of transport policies to reduce climate change impacts. Working Paper, *Fondazione Eni Enrico Mattei*, 12, 1-23.

Chang, C.P. (2006). Managing Business attributes and performance for commercial banks. *The Journal of American Academy of Business*, 9(1), 104-109.

Cheng, R. W., Chin, T.L., & Pei, H.T. (2010). Evaluating Business performance of wealth management banks. *European Journal of Operational Research*, 207(2), 971-979.

Cheung, Y., Tan, W., Ahn, H., & Zhang, Z. (2010). Does corporate social responsibility matter in Asian emerging markets? *Journal of Business Ethics*, 92, 401-413.

De La Fuente, A., Pons, O., Josa, A., & Aguado, A. (2016). Multi-criteria decision making in the sustainability assessment of sewerage pipe systems. *Journal of Cleaner Production,* 112, 4762-4770.

De Montis A., De Toro P., Droste-Franke B., Omann I., & Stagl, S. (2005). *Assessing the quality of different MCDA methods*. Abingdon, England: Routledge.

Despica O., & Simonovic P. (2000). Aggregation operators for soft decision making in water resources, *Fuzzy Sets and Systems,* 115, 11–33.

Ding X, Zhong W, Shearmur R.G., Zhang X., & Huisingh D. (2015). An inclusive model for assessing the sustainability of cities in developing countries – Trinity of cities' sustainability from spatial, logical and time dimensions (TCS-SLTD). *Journal of Cleaner Production*, 109, 62–75.

Eccles, R.G., Krzus, M.P., & Serafeim, G. (2011). Market interest in non-financial information. *Journal of Applied Corporate Finance*, 23(4), 113-127.

Edelman Trust Barometer (2009). *2009 Edelman trust barometer executive summary*. Retrieved from https://www.edelman.com/assets/uploads/2014/01/2009-Trust-Barometer-Executive-Summary.pdf

Edelman Trust Barometer (2016). *2016 Edelman Trust Barometer Executive Summary*. Retrieved from http://www.edelman.com/insights/intellectual-property/2016-edelman-trust-barometer/executive-summary/

Egilmez, G., Gumus, S., & Kucukvar, M. (2015). Environmental sustainability benchmarking of the U.S. and Canada metropoles: An expert judgment-based multicriteria decision making approach. *Cities: The International Journal of Urban Policy and Planning*, 42, 31-41.

Elkington, J. (1998). Accounting for the triple bottom line. *Measuring Business Excellence*, 2(3), 18 – 22.

Ferretti, V. (2016). From stakeholders analysis to cognitive mapping and multi-attribute value theory: An integrated approach for policy support. *European Journal of Operational Research*, 253(2), 524–541.

Gal, T., Stewart, T.J., & Hanne, T. (1999). *Multicriteria decision making advances in MCDM Models, algorithms, theory and applications.* Boston: Kluwer Academic Publishers.

Global Reporting Initiative (2016). *GRI's History*. Retrieved from https://www.globalreporting.org/information/aboutgri/grihistory/Pages/GRI's%20history.aspx

Glur, C. (2016). *Ahp: Analytic Hierarchy Process, R package version 0.2.8.* Retrieved from http://CRAN.R-project.org/package=ahp.

Godfrey, P., Merrill, C., & Hansen, J. (2009). The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis. *Strategic Management Journal*, 30(4), 425-445.

Hoekman, B. M., & Togan, S. (2005), *Turkey: Economic Reform and Accession to the European Union*. Washington: World Bank/CEPR.

Ioannou, I., & Serafeim, G. (2014). The consequences of mandatory corporate sustainability reporting: Evidence from four countries. *Harvard Business School Working Paper*, 11-100.

Ioannou, I., & Serafeim, G. (2015). The Impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics. *Strategic Management Journal*, 36(7), 1053–1081.

Karjalainen, T. P., Rossi, P. M., Ala-aho, P., Eskelinen, R., Reinikainen, K., Kløve, B., … Yang, H. (2013). A decision analysis framework for stakeholder involvement and learning in groundwater management. *Hydrology and Earth System Sciences*, 17, 5141–5153.

Kaytaz, M., & Gul, M. C. (2013). Corporate Social responsibility in the Turkish banking industry and the current economic crisis. *American Society of Business and Behavioral Sciences*, 20(1), 155-164.

Keeney, R. L., & Raiffa, H. (1976). *Decisions with multiple objectives-preferences and value tradeoffs*. Cambridge, England: Cambridge University Press.

Keskin, E. (2001). 2000 yılında Türkiye ekonomisi ve Türk bankacılık sistemi, *Bankacılar Dergisi*, Sayı: 37.

Klement, E.P., Mesiar, R., & Pap, E. (2000). *Triangular norms*. Dordrecht, Netherlands: Kluwer Academic Publishers

Kodikara P.N., Perera B.J.C., & Kularathna M.D.U.P. (2010). Stakeholder preference elicitation and modelling in multi-criteria decision analysis — a case study on urban water supply. *European Journal of Operational Research*, 206(1), 209–20.

KPMG. (2013). *The KPMG survey of corporate responsibility reporting 2013.* Retrieved from https://www.globalreporting.org/information/news-and-press-center/Pages/GRI-is-the-global-standard-as-sustainability-reporting-goes mainstream-says-KPMG-survey.aspx

Kucukvar, M., Gumus, S., Egilmez, G., & Tatari, O. (2014). Ranking the sustainability performance of pavements: An intuitionistic fuzzy decision making method. *Automation in Construction*, 40, 33-43.

Lai, E., Lundiea S., & Ashbolt, J.N. (2008). Review of multi-criteria decision aid for integrated sustainability assessment of urban water systems. *Urban Water Journal*, 5, 315–327.

Mann S. H., & Triantaphyllou, E. (1995). Using The analytic hierarchy process for decision making in engineering applications: Some challenges, *International Journal of Industrial Engineering: Applications and Practice*, 2(1), 35-44.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63(2), 81– 97.

Minna, Y., & Zhao, R. (2015). Sustainability and firm valuation: An international investigation, *International Journal of Accounting and Information Management*, 23(3), 289 – 307.

Mulliner, E., Malys, N., & Maliene, V. (2016). Comparative analysis of MCDM methods for the assessment of sustainable housing affordability, *Omega,* 59, 146-156.

Mustajoki, J., Saarikoski, H., Marttunen, M., Ahtikoski, A., Hallikainen, V., Helle, T., … Ylisirniö, A.-L. (2011). Use of decision analysis interviews to support the sustainable use of the forests in Finnish Upper Lapland. *Journal of Environmental Management,* 92, 1550– 1563.

Orlitzky M., Frank L., Schmidt, S. L. R. (2003). Corporate social and financial performance: A meta-analysis, *Organization Studies,* 24(3), 403–441.

Packer, N. (2011). *A Beginner's guide to energy and power.* Retrieved from http://www.rets-project.eu/UserFiles/File/pdf/respedia/A-Beginners-Guide-to Energy-and-Power-EN.pdf.

Pinar M., Cruciani C., Giove S., & Sostero, M. (2014). Constructing the FEEM sustainability index: A choquet integral application, *Ecological Indicators*, 39, 189–202.

Republic of Turkey Energy Market Regulatory. (2005). Communiqué regarding the determination of natural gas volume subject to invoicing process and the elements of invoicing process. Retrieved from http://www.epdk.org.tr/TR/Tuketici/Dogalgaz

Ryu J.H., Palmer R.N., Jeong S, Lee J.H., & Kim Y.O. (2009). Sustainable water resources management in a conflict resolution framework. *Journal of the American Water Resources Association*, 45, 485–499.

Saaty R.W. (1987). The analytic hierarchy process—what it is and how it is used. *Mathematical Modelling,* 9(3–5), 161-176.

Saaty, T, L., & Peniwati, K., & Jen, S. S. (2007). The analytic hierarchy process and human resource allocation: Half the story. *Mathematical and Computer Modelling*, 46(7-8), 1041 – 1053.

Saaty, T. L. (1995). *Decision making for leaders: The analytic hierarchy process for decision in a complex world*. Pittsburgh, PA: RWS publications.

Saaty, T.L. (2004). Decision making – The Analytic Hierarchy and Network Processes (AHP/ANP). *Journal of Systems Science and Systems Engineering*, 13(1), 1–35.

Saaty, T.L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, 1(1), 83–98.

Saaty, T. L., & Peniwati, K. (2008). *Group decision making: Drawing out and reconciling differences*. Pittsburgh, PA: RWS Publications.

Schaltegger, S., Bennett, M., & Burritt, R., (2006). *Sustainability accounting and reporting*. Dordrecht, Netherlands: Springer.

Serdengeçti, S. (2002). Reflections on the February 2001 Turkish crisis: Lessons from a Central banker's perspective, Paper presented at METU International Conference in Economics VI, Ankara, Turkey. Retrieved from http://www.tcmb.gov.tr/wps/wcm/connect/a9a43c90-669d-4713-a307-8080d358b19a/2002-2.pdf?MOD=AJPERES&CACHEID=a9a43c90-669d-4713-a307-8080d358b19a.

Shtub, A.; Bard, J.F., & Globerson, S. (2005). *Project management, engineering technology and implementation*. Upper Saddle River, NJ: Prentice Hall.

Stefanovic, G., Milutinovic, B., Vucicevic, B., Dencic-Mihajlov, K., & Turanjanin, V. (2016). A comparison of the analytic hierarchy process and the analysis and synthesis of parameters under information deficiency method for assessing the sustainability of waste management scenarios. *Journal of Cleaner Production*, 130, 155-165.

Taskin, D. (2015). The relationship between CSR and Banks' financial performance: Evidence from Turkey, *Journal of Yasar University*, 10(39), 21-30.

Triantaphyllou, E., Lootsma, F.A., Pardalos, P.M., & Mann, S.H. (1994). On the Evaluation and application of different scales for quantifying pairwise comparisons in fuzzy sets. *Journal of Multi-Criteria Decision Analysis*, 3, 1-23.

Türkiye Cumhuriyeti Bilim Sanayi ve Teknoloji Bakanlığı. (2013). Kalkınmada Anahtar Verimlilik: İs Dünyası İçin Sürdürülebilirlik Neden Önemli? Retrieved from https://anahtar.sanayi.gov.tr/tr/news/is-dunyasi-icin-surdurulebilirlik-neden-onemli/457

Ulengin, F., Kabak, O., Onsel, S., Ulengin, B., & Aktas, E. (2010). A problem-structuring model for analyzing transportation–environment relationships. *European Journal of Operational Research*, 200, 844–859.

World Economic Forum. (2015). *The Measurement of Sustainable Competitiveness*. Retrieved from http://reports.weforum.org/global-competitiveness-report-2014-2015/the-measurement-of-sustainable-competitiveness/

Yağcılar, G., (2011). Türk Bankacılık sektörünün rekabet yapısının analizi. Bankacılık Düzenleme ve Denetleme Kurulu Raporu. Ankara.

Zhou, J., Shen, L., Song, X., & Zhang, X. (2015). Selection and modeling sustainable urbanization indicators: A responsibility-based method. *Ecological Indicators*, 56, 87-95.