

DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION
BUSINESS ADMINISTRATION PROGRAM
MASTER'S THESIS

**ENVIRONMENTAL COST MANAGEMENT: AN
APPLICATION IN SLAUGHTER HOUSE**

Ahror BOBOJONOV

Supervisor

Assoc. Prof. Dr. Banu Esra ASLANERTİK

İZMİR - 2011

MASTER THESIS/PROJECT
APPROVAL PAGE

University : Dokuz Eylül University
Graduate School : Graduate School of Social Sciences
Name and Surname : Ahror BOBOJONOV
Title of Thesis : Environmental Cost Management: An Application in Slaughter House

Defence Date : 02.12.2011

Supervisor : Doç.Dr.Banu Esra ASLANERTİK

EXAMINING COMMITTEE MEMBERS

<u>Title, Name and Surname</u>	<u>University</u>	<u>Signature</u>
Doç.Dr.Banu Esra ASLANERTİK	DOKUZ EYLÜL ÜNİVERSİTESİ	
Doç.Dr.Burcu İLTER	DOKUZ EYLÜL ÜNİVERSİTESİ	
Yrd.Doç.Dr.İşıl ÖZGEN	DOKUZ EYLÜL ÜNİVERSİTESİ	

Unanimity (X)

Majority of votes ()

The thesis titled as "**Environmental Cost Management: An Application in Slaughter House**" prepared and presented by Ahror BOBOJONOV is accepted and approved.

Prof.Dr. Utku UTKULU
Director

DECLARATION

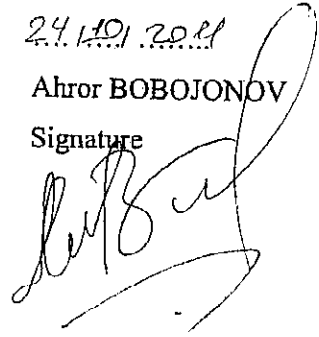
I hereby declare that this master's thesis titled as "ENVIRONMENTAL COST MANAGEMENT: AN APPLICATION IN SLAUGHTER HOUSE" has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honour.

Date

24.10.2021

Ahror BOBOJONOV

Signature

A handwritten signature in black ink, appearing to be 'Ahror Bobojonov', written over a horizontal line.

ÖZET

Yüksek Lisans Tezi
ÇEVRE MALİYET YÖNETİMİ: Kesimhane Uygulaması
Ahror BOBOJONOV

Dokuz Eylül Üniversitesi
Sosyal Bilimler Enstitüsü
İngilizce İşletme Anabilim Dalı
İngilizce İşletme Yönetimi Programı

Globalleşen ve rekabetçiliği artan bir dünyada, her bir şirket bir mücadele içindedir ve başarılı olma eğilimindedir. Günümüzde şirketlerin çevresel çıkarmaları ile ilgili performansları farklı platformlarda söz konusu olmuştur. Bu çıkarmalar daha çok stratejik önlemlerinin belirlenmesi ile ilgili yönelmiştir. Çevre ve mali performansları genellikle paraya dönüştürme veri başarı ve etkisini hesaplama zorluğu nedeniyle ayrı-ayrı yönetilmektedir. İş ticaretin bakış açısına göre, yâda başka bir deyişle, "Her şirketin hedefi, daha çok kar elde etmektir". Buna bağlı olarak ta bir soru ile karşı-karşı gelmekteyiz: Bir şirket başarılı olabilmesi için neler yapılması gerek? Yanıt ve ana fikir olarak, şirketler uzun vadede ve sürdürülebilirliğini sağlayacak şekilde yaşamını sürdürmelidir. Bu yaşam mali konulara bağlı olduğu kadar da, aynı zamanda çevre ile ilgili konularına da bağlıdır.

Endüstriyel durum çevresel kaynakların yüksek girdiler eşliğinde öte yandan, ekonomik büyüme ile karakterize olmuş bir yapıyı teşkil etmektedir. Buna ek olarak, artan küresel iş faaliyetleri yanı sıra şirketlerin rekabet ve maliyet baskılarının karşı karşıya kalmış durumundadır. Çevresel performansın ürün imajı üzerinde olumlu etkisinin olması yanında atık ta bir şirket için gelir kaynağı oluşturabilir. Burada önemli olan bu konuların öneminin farkında olmaktadır. Bu nedenle bu çalışma çevre odaklı muhasebe konuların ana kavramların açıklaması ve Çevre Muhasebe Yönetiminin Türk Tavukçuluk Sanayindeki yeri ve önemini açıklamaktadır. Birinci bölüm çevre ile ilgili finansal kavramları üzerinde yoğunlaşmıştır. İkinci bölümde, Çevre

Yönetim Muhasebenin alt başlıkların açıklamaları ve önemini vurgulamaktadır. Üçüncü bölüm, bu konu ile ilgili tecrübe edinmiş farklı araştırmacıların çalışmalarından ve tezlerden esinlenerek bir edebiyat taraması olarak yapılandırılmıştır. Dördüncü bölüm gerçek hayatta, bir işletmede Çevre Muhasebe Yönetiminin uygulamasını izah etmektedir. Bu bölümde, çevresel önlemlerin uygulamaları ve Çevresel Maliyet Muhasebesi yöntemleri kullanarak bu önlemlerin kullanılmasının açıklamaları yer almaktadır. Tüm bu açıklamaların ve araştırma sonucunda ortaya çıkan tezlerin özeti ve değerlendirmesi son bölümde bir araya getirilmiştir.

Anahtar Kelimeler: Çevre ve Finansal performans, sürdürülebilirlik, Çevre Muhasebe Yönetimi ve Çevre Maliyet Yönetimi.

ABSTRACT

**Master's Thesis
ENVIRONMENTAL COST MANAGEMENT: An Application in Slaughter
House
Ahror BOBOJONOV**

**Dokuz Eylül University
Graduate School of Social Sciences
Department of Business Administration (English)
Business Management Program**

In today's global and competitive world, each company tends to be successful in challenge market. Company's performance related to environmental issues was concerned most nowadays in different platforms. These were involving very much on its policy making. Environmental and financial performances were usually managed separately due to the difficulty of data achievement and calculation of its impact in converting to money. Looking from business prospect or in other words it would be better to spell it as "each firm tends to earn more and more." A question occurs as what should firm in order to do to be successful? Hence, firms should survive for a long term and achieve sustainability. It does not depend only on financial issues. It is also related to environmental impacts.

The industrial situation is characterized on the one hand by economic growth and, on the other hand accompanied by high inputs of environmental resources. In addition, companies are facing competition and cost pressures as well as increasing global business activities. It should be realized that good environmental performance can improve the product image, while the waste can also create additional income to the company. Therefore this thesis concerned on explanation of main concept of financially environmental oriented subjects, and the place of Environmental Management Accounting in Turkish Poultry Industry. First chapter concentrates on financial environment concepts. Second chapter highlights the sub divisions of Environmental Management

Accounting, and importance of it. Third chapter is structured as a literature review from different scholars and publications. Penultimate chapter related to case study. This chapter describes the implementation of environment prevention and using of systems or methods of Environmental Cost Accounting. Last chapter is the part where all these explanation and information's are summarized and ends with under the conclusion title.

Keywords: Environmental and Financial performance, Sustainability, Environmental Management Accounting, Environmental Cost Management.

ENVIRONMENTAL COST MANAGEMENT: An Application in Slaughter House

TABLE OF CONTENTS

APPROVAL PAGE	ii
DECLARATION	iii
ÖZET	iv
ABSTRACT	vi
CONTENTS	viii
LIST OF ABBREVIATIONS	x
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF PICTURES	xiii
INTRODUCTION	1
1. GENERAL ACCOUNTING CONCEPTS AND SUSTAINABILITY.....	4
1.1. Financial Accounting.....	4
1.2. Cost Accounting.....	5
1.3. Management Accounting.....	5
1.3.1. Sustainability.....	8
1.3.2. Social Reporting.....	13
2. ENVIRONMENTAL MANAGEMENT ACCOUNTING1.....	5
2.1. Environmental Accounting Context and Concepts.....	16
2.2. Environmental Management Accounting Definition.....	19
2.2.1. EMA Physical Information (Waste Management and Performance Indicators).....	21
2.2.2. EMA Monetary Information (Cost Types, Cost Categories, Cost Assessment.).....	25

2.3. Environmental Management System.....	34
2.4. Benefits Of Environmental Management Accounting.....	35
2.5. Environmental Aspects in the Financial Statements (Balance Sheet and Income Statement).....	39
 3. LITERATURE REVIEW FOR CASE STUDY.....	 47
 4. CASE STUDY.....	 57
4.1. Aim of the Study.....	57
4.2. Methodology.....	58
4.3. Limitations.....	62
4.4. Description.....	63
4.5. Case Study.....	65
4.6. FINDINGS and CONCLUSION.....	82

REFERENCES

LIST OF ABBREVIATIONS

ABC	Activity Based Costing
AICPA	American Institute of Certified Public Accountants
CP	Cleaner Production
CPA	Cleaner Production Assessment
EM	Environmental Management
EMA	Environmental Management Accounting
EMAN	Environmental Management Accounting Network
EMS	Environmental Management System
End-of-Pipe	Pollution treatment or abatement technology
EPA	U.S. Environmental Protection Agency
EU	European Union
EUROSIF	European Sustainable and Responsible Investment Forum
GRI	Global Reporting Initiative
IAS	International Accounting Standards
ICAEW	Institute of Chartered Accountants in England and Wales
IIRC	Responsibility Research Center
ISO 14001	International Standards Organization – Environmental Management System Standard
IRR	Internal Rate of Return
NAE	National Academy of Engineering
NDCEE	National Defense Center for Environmental Excellence
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
UNCED	United Nations Conference on Environment and Development
UNCTAD/ISAR	United Nations Conference on Trade and Development Intergovernmental Working Group of Experts
UNSD	United Nations Division for Sustainable Development
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
USD	United States Currency
VNCI	Association of the Dutch Chemical Industry

LIST OF TABLES

Table 1. Organizational Level Accounting and Reporting

Table 2. Physical Materials Accounting: Input and Output Types

Table 3. Total Corporate environmental Expenditure Principle Calculation

Table 4. Environmental Related Cost Categories

Table 5. Environmental Cost Assessment Scheme

Table 6. Structure of the Chart of Accounts

Table 7. Structure of the Balance Sheet

Table 8. Cost-Categories-Oriented Format

Table 9. Cost-of-Sales

Table 10. Slaughter Byproducts Income Rate

Table 11. Annual expenditures of Slaughter House

LIST OF FIGURES

Figure 1. Terminology of Financial Accounting and Cost Accounting

Figure 2. Environmental Management Accounting in Relation to other Approaches to Environmental Accounting in Internal, External, Financial and Non-Financial Perspectives

Figure 3. Environmental Management Accounting Combines Monetary and Physical Data

Figure 4. Materials Flow Accounting

Figure 5. Material Flows are Money Flows

Figure 6. Material and Money Flow in a Paint Shop

Figure 7. Levels of Environmental Embeddedness

Figure 8. Benefits and Use of environmental Management Accounting

Figure 9. Structure of the Thesis

Figure 10. Poultry Market and Production Chain

Figure 11. Chicken-Slaughter Production Line

Figure 12. Byproducts Which Derived from the Production Stages

Figure 13. Waste Assessment Scheme

LIST OF PICTURES

Picture 1. Hanging Line

Picture 2. Slaughtering

Picture 3. Plucking

Picture 4. Comb Slaughtering

Picture 5. Head Tear Out

Picture 6. Internal Extraction and Cleaning

Picture 7. Vacuum Cleaning

Picture 8. Pre-Cooling Stage (Chiller)

Picture 9. Centrifuge

Picture 10. Sorting and Packing

INTRODUCTION

Over the last decade, an increasing number of companies have integrated the environmental aspects of their operations and services into their daily business practices (Schot and Fisher, 1993; Berry and Rondinelli, 1998). The concern of companies on ecological matters has shifted away from an approach of regulatory compliance that was typical of the seventies and eighties (Gladwin, Kenelly and Krause, 1995). Instead, there is growing evidence that corporations anticipate regulatory compliance and reduce waste and pollution in advance of regulation (Reinhardt, 1999). The more environmentally oriented companies are even going beyond pollution control strategies and explore new opportunities for the development of green technologies and green products (Klassen, 2000). In addition, industrial associations, governmental and international organizations produced a series of standards that corporations can use as guidelines and benchmarks for their environmental management systems (King and Lenox, 2000). Among these standards, the widely used is ISO 14001, which can provide a managerial framework in which an organization can design an environmental management system that identifies an organizations environmental policy, the environmental aspects of its operations and a set of clearly defined objectives for environmental improvement (Murray, 1999). The adoption of ISO 14001 is extremely growing worldwide.

Greening of business refers to a combination of business principles and practices about environmental management and social responsibilities that can be summarized under a precise definition. The label overlaps with terms like sustainability and, more recently, corporate social responsibility that depends on various interpretations. These concepts will be explained in more details in further chapters.

In fact, ecological issues cannot be limited to the manufacturing sector in which environmental aspects have been traditionally considered as a key societal concern. For instance, an increasing number of banks have adhered to, so called Socially Responsible Investing initiatives in the financial sector (EUROSIF, 2003;

The Global Compact, 2004). The spread of environmental and social information about companies has been prompted by the diffusion of private research firms that specialize in the collection and provision of sustainable profiles to banks, insurers and institutional investors. Among the most well known Social Responsible Investing ranking indexes, the Dow Jones Sustainability Index and the FTSE4Good Index provide benchmarks and orientate investments in companies with positive records of social and environmental performance. Growing attention from the financial community is also directed towards the creation of greenhouse gas markets, particularly in light of current developments in international climate change policy (Pew Center on Global Change, 2002)

Companies and managers are under an increasing pressure to demonstrate high levels of organizational performance not only in terms of competitiveness, market growth and financial results, but also with regard to their long-term environmental performance and sustainability (Epstein and Brichard, 1999; Eccles, Herz, Keagan and Philips, 2001). In February 2004, the survey results released by the Global Environmental Management Initiative, based on earlier research by Cap Gemini Ernst & Young, came to the conclusion that:

- 50 to 90% of a firm's market value can be attributed to intangible like Environmental, Health and Safety performance;
- 35% of institutional investors portfolio allocations decisions are based on intangibles like Environmental, Health and Safety performance;
- 81% of Global 500 executives rates Environmental, Health and Safety issues among the top ten factors which drive value in their businesses.

Another recent survey highlighted by Price Waterhouse Coopers in 2004 gets results from a sample of 1,400 CEOs of multinational corporations operating in 40 countries as follows:

- 67% disagreed with the statement that sustainability is largely a public relation issue, up from 50% in 2002;

- 79% agreed that sustainability is vital to the profitability of any company, up from 69% in 2002;
- 68% disagreed with the suggestion that the current economic climate will render sustainability a lower priority, compared to 60% in 2002;
- 71% of CEO's agreed that, when implementing a sustainability program in their organizations, they would consider sacrificing short-term profitability, if necessary, in exchange for long-term shareholder value.

From these highlights, it appears that greening is moving beyond the boundaries of legal compliance and corporate philanthropy and starts to occupy a more central position in business management alongside conventional strategic issues (Epstein, 1996; Kolk, 2000).

Hence, Environmental performance is a very important measure of the success for all companies. Due to this, managing environmental accounting becomes one of the significant subjects. In which situations businesses face with Environmental Cost Management or Environmental Cost Accounting concepts? Before handling this question, the main concepts of Environmental Cost Management will be explained in detail.

CHAPTER 1

GENERAL ACCOUNTING CONCEPTS AND SUSTAINABILITY

1.1. Financial Accounting

Finance is the science of funds management. Finance includes saving money and often includes lending money. The field of finance deals with the concepts of time, money, risk and how they are interrelated.

Investors, shareholders and financial authorities that have a strong economic interest in company circumstance, observe instantly or periodically actual economic performance of the company. Therefore, financial accounting and reporting are being dealt with national laws and international accounting standards. Financial accounting comprises: bookkeeping, balancing, and preparation of financial statements, consolidation, auditing of the financial statements and reporting. Financial accounting deals with revenues and expenditures as shown in the profit and loss account, with asset and liabilities as listed in the balance sheet.

Figure 1. Terminology of financial accounting and cost accounting

Financial Accounting	Cost Accounting
Balance sheet	
Assets	
Liabilities	
Profit and loss account	Cost statement
Expenditure	Cost
Expenditure items	Cost categories
Revenue	Earnings
	Cost Calculation
	Cost centres
Calculation of production expenditure	Cost carriers/objects (products)

Source: (*“Environmental Management Accounting Procedures and Principles”*, United Nations, New York, 2011)

1.2. Cost Accounting

Cost accounting is used to help managers to understand the costs of running a business. Modern cost accounting originated which was during the industrial revolution complexities of running a large scale business led to the development of systems for recording and tracking costs to help business owners and managers make decisions. (Aslanertik, 2007)

Cost and management accounting includes budget and actual cost of operations, processes, departments or product pricing and the analysis of variances, profitability or social use of funds. Generally cost accounting comes into stage in internal decision making processes. Managers use cost accounting information to support decision making, to reduce a company's costs and improve profitability. Cost accounting depends on the data which was generated from financial accounting. Hence, cost accounting becomes a significant element of Financial Reporting.

1.3. Management Accounting

The Chartered Institute of Management Accountants (CIMA), states that Management Accounting is "the process of identification, measurement, accumulation, analysis, preparation, interpretation and communication of information used by management to plan, evaluate and control within circumstance and to assure applicable use of and accountability for its resources. Management accounting also comprises the preparation of financial reports for non-management groups such as shareholders, creditors, regulatory agencies and tax authorities" (CIMA Official Terminology).

The American Institute of Certified Public Accountants (AICPA) states that management accounting as practice extends to the following three areas:

- Strategic Management—developing the role of the management accountant as a strategic partner in the organization.

- Performance Management—developing the practice of business decision-making and managing the performance of the organization.
- Risk Management—assisting to frameworks and practices for identifying, measuring, managing and reporting risks to the achievement of the objectives of the organization.

According to the Institute of Certified Management Accountants (ICMA); "A management accounting prepares and presents financial and other decision oriented information in such a way as to assist management in the formulation of policies and in the planning and control of the operation of the undertaking." Therefore, Management Accounting creates value in accounting sphere. It was mainly interested in forward looking and taking decisions that will affect the future of the organization, than in the historical recording and compliance (scorekeeping) aspects of the profession. Management accounting knowledge and experience can therefore be obtained from various fields and functions within an organization, such as information management, treasury, efficiency, auditing, marketing, valuation, pricing, logistics, etc.

In contrast, Management Accounting primarily focuses on satisfying the information needs of internal management. Although there are accepted good practices in the realm of Management Accounting, these practices are generally not regulated by law. Each organization can determine which Management Accounting practices and information are best suited to its organizational goals and culture through a cost-benefit approach.

Management Accounting focuses on both monetary and non-monetary information (for example, cost drivers such as labor hours and quantities of raw materials purchased) that provides information for management decisions and activities such as planning and budgeting, ensuring efficient use of resources, performance measurement and formulation of business policies and strategies. (International Federation of Accountants, 2005)

The International Federation of Accountants Statement (2005) called *Management Accounting Concepts* outlines how the field of Management Accounting has evolved over time, in four recognizable stages, with a different focus in each stage:

Stage 1 (prior to 1950) – a focus on cost determination and financial control;

Stage 2 (by 1965) – a focus on the provision of information for management planning and control;

Stage 3 (by 1985) – a focus on the reduction of waste in resources used in business processes;

Stage 4 (by 1995) – a focus on generation or creation of value through the effective use of resources.

According to the International Federation of Accountants' (1998) analysis, the leading-edge practice of Management Accounting has shifted beyond information provision to focus on the decreasing of waste (the reduction of resource loss) and the generation of value (the effective use of resources).

There are many linkages between an organization's Financial Accounting and Management Accounting practices. For example, bookkeeping can be seen as a data collection process that generates information for both internal and external users. Total costs and earnings that may be calculated for Management Accounting purposes are related to the organization-wide revenues and expenditures collected for financial reporting purposes. Most companies, particularly small and medium-sized ones, do not have an independent Management Accounting system; they simply use data initially developed for Financial Accounting purposes for internal decision making as well as for external reporting, perhaps with a few small adjustments and with some limited additional cost reports.

The economic and environmental issues typically considered together under Environmental Accounting efforts are the only two of the three supporting points of Sustainable Development, which can be defined as dealing with economic, environmental and social issues (such as employment, education and cultural issues)

in a way that meets both present and future human needs. With sustainability in mind, a number of stakeholders have begun to focus on Sustainability Accounting research and practice that includes not only the economic and environmental components of Environmental Accounting, but also the social issues essential to overall sustainability.

1.3.1. Sustainability

*“Manaaki Whenua, Manaaki Tangata, Haere whakamu,
Toitū he whenua, whatungarongaro he tangata.”*

“Care for the land, Care for the people, Go forward,
Land is permanent, man disappears.”

Manaaki Whenua

(Māori are the indigenous people of Aotearoa (New Zealand), and the Māori name for Landcare Research is Manaaki Whenua. Manaaki means to cherish, conserve, and sustain. Whenua encompasses the soil, rocks, plants, animals and the people inhabiting the land - the tangata whenua. People are linked physically and spiritually to the land - it is the earth through which we are connected to our ancestors and all the generations that will come after us. Whenua is the places where we stand.)

The accounting legislations and regulations have been changed since the past time, except basic and logic rules. These changes depend to global economic aspects. It means new concepts as environmental accounting etc., concepts' integrated with accounting. This creates more reliable and sustainable meaning of accounting to develop green economy. Practice shows that the experience from the past evaluated new shape of accounting principles. Like some obstacles which barrier process's in management accounting? Launched before where the decisions developed. Herewith new accounting practices subsequently devoted considerable resources to the development of a more innovative skills set for management accounting.

The difference between ‘traditional’ and ‘innovative’ accounting practices can be illustrated by cost control techniques. Cost accounting is a central method in management accounting, and traditionally, management accountants’ principal technique was *variance analysis*, which is a systematic approach to the comparison of the actual and budgeted costs of the raw materials and labor used during a production period. While some form of variance analysis is still used by most manufacturing firms, it nowadays tends to be used in conjunction with innovative techniques such as *life cycle cost analysis* and *activity-based costing*, which are designed with specific aspects of the modern business environment (Marty Spitzer, 1995).

Life-cycle costing recognizes that managers’ ability to affect the cost of manufacturing a product before the design has been finalized and production commenced when the product is still at the design stage of its product life-cycle, since small changes to the product design may lead to significant savings in the cost of manufacturing the products (Marty Spitzer, 1995).

Activity-based costing (ABC) recognizes that, in modern factories, most manufacturing costs are determined by the amount of ‘activities’ (e.g., the number of production runs per month, and the amount of production equipment idle time) and that the key to effective cost control is therefore optimizing the efficiency of these activities. Activity-based accounting is also known as *Cause and Effect accounting*. Both lifecycle costing and activity-based costing recognize that, in the typical modern factory, to prevent from corruptive events (such as machine breakdowns and quality control failures) is of far greater importance than (for example) reducing the costs of raw materials. Activity-based costing also deemphasizes direct labor as a cost driver and concentrates instead on activities that drive costs, such as the provision of a service or the production of a product component. The main debate is to apply or to determine the right accounting techniques. Here significant implication is to apply a sustainable technique. That drives us to a new concept called sustainability. Sustainability is not only doing the right thing. It is often not clear what is the right thing to do is. Questions about whether an activity is sustainable are

complex and seen to require answers based on systematic data collection, accounting and reporting procedures (*"Sustainability: the role of accountants"*, The Institute of Chartered Accountants in England & Wales, October 2004).

Financial reporting is a legal requirement for organizations across the world. Hence accounting for the effects of their strategies, practices and outcomes on external stakeholders requires non-financial measurement. This non-financial reporting of the performance of organizations – which is becoming known as corporate responsibility reporting or sustainability reporting – has moved from being virtually non-existent in the 1980s to being unusual in the 1990s to being expected for all large organizations in the 2000s (White, 2005). Yet, in most cases, non-financial reporting is voluntary, there are no agreed local or global standards, no agreed metrics, no benchmarks and no objective external assessment. There is also a continuing perception that organizations are producing sustainability reports primarily as a public relations exercise – sometimes called ‘greenwash’ – to give the impression of concern over social and environmental issues, whilst only paying lip service to the underlying issues of sustainability for organizations and their stakeholders. Consequently, it is not surprising that sustainability reporting has yet to be understood, accepted or treated as of equal importance and value in assessing overall organizational performance. (Hubbard, 2008)

In 1987 the United Nations Brundtland Commission referred to the sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Under this definition sustainability becomes a long term, future focused concept with favorable results to whole system (people, the economy, society, the built and natural environment). Sustainability reporting at the enterprise level therefore aims to represent an enterprise’s environmental, social and economic performance and the related effect on the world around it.

The environmental dimension is generally well understood, unless the measurement of external effects becomes controversial. Social performance is

normally linked with ethical issues and includes labor practices, human rights policy, product responsibility and the enterprises relationship with society. Typical economic indicators in a sustainability report would cover job creation, productivity, outsourcing expenditures, employment diversity and training as a contribution to the wider economy. Economic performance is not the same as the creation of shareholders value.

Sustainability concerns of individuals, societies and governments help shaping the world in which organizations are operating. From a past history it could be noticed that mankind make some little contribution for the sustainable development of the world. There have been several preliminary political contributions related to sustainable development. Examples can be given as: Rio declaration (1992), the Kyoto protocol (1997) and the Johannesburg World Summit (2002). The significant content of Kyoto Protocol for industrialized countries is to reduce the emission of greenhouse gases.

In 1998 Elkington developed the term ‘triple bottom line’ to argue the case for reporting environmental and social performance together with economic performance. The triple bottom line concept implied that economic, environmental and social ‘performance’ were to be balanced and were of equal importance. The introduction of ‘social’ aspects introduced that organizations had impacts on the communities in which they operated and also on the people who worked for the organization. Over time, many voluntarily-produced ‘environmental’ reports turned into ‘environmental and social’ reports, to support the financial (‘economic’) reports which are legally required. The elements of a triple bottom line were produced, albeit in two different reports. However, there was no single ‘bottom line’ for either environment or social as there was with the financial bottom line.

In the recent years, most of the companies have extended the scope of their social responsibility efforts as they are being held accountable not only for their own financial performance but also for social performance by their customers. As organizations have began to understand that their responsibilities are more than to

maximize returns or to pay taxes, they recognize the crucial importance of their stakeholders, which include customers, employees, shareholders, supplier, and all other business partners. Poor social performance at any kind of business operation will result with bad reputation, loosing prestige and the most important, loosing competitive advantage. (Aslanertik, 2004)

While there are many issues which arise out of the current state of practice, future research might concentrate on the following issues through looking at large, multinational organizations and the decisions they have made about sustainability reporting and their experience resulting from that, both in terms of the reporting and also of the practice. These companies are the leaders in reporting and have the largest impacts on external stakeholders. The issues we would propose to research are: (Hubbard, 2008)

1. What impacts has sustainability reporting had on large multinational companies? Has sustainability reporting been useful for them and their stakeholders and in what ways? Has sustainability reporting changed their organizational strategies and practices?
2. What reporting frameworks are large multinationals using? Why have they chosen these frameworks?
3. Why have many multinationals still not adopted sustainability reporting? Have they changed their strategies and practices without matching reporting?
4. How does/how can sustainability reporting provide value to stakeholders of multinationals? Which stakeholders receive most value and which receive least?
5. How do investors in multinationals view the value of sustainability reporting and the various frameworks in particular? What do they want from sustainability reporting? What are the barriers to delivery?
6. What are the key issues which large organizations see for the future of sustainability reporting and how do they believe they will be solved?

By focusing on the practices and changes of the leading and largest organizations, insights can be derived into the wider future effects likely for all organizations, as well as the current issues which are perceived by those who are leading edge practitioners. (Hubbard, 2008)

1.3.2. Social Reporting

Practice shows that; the main key of the successful business is built on truth, good will, honest, and transparent comprehension in all stage and with all units. Hence, doing business with frauds cannot be seen as a way to be profitable. Since 1990s companies top management more conspicuous about the social and environmental establishment of their diligent business. These pressure sources occurred from different factor lines:

- **Consumers** attended about the ethnical implications of their purchases,
- **Shareholders** seeking to integrate social and environmental risks into their investment decisions,
- **Communities** and **civil society organizations** demanding to know the value those companies come across with society,
- **Employees** who want guarantee from the company they work for in order to be a good corporate citizen.

As a response to these pressures or more delicately requests, the firms should have to announce and publish their social and environmental profile. Thus; this announcement allows the companies to offer a window into how it views key social and environmental risks and opportunities on the basis of business practices. In this instance Social Reporting becomes an easiest and common way to describe publications of the company's status. Social reporting also named as sustainability reports, corporate responsibility reports, and corporate citizenship reports can be seen in the literature.

Actually, a social report is a recurring process. That clarifies the performance of the companies, and involves measurements. Thus, shareholders, managers and

public can see the point from which company started, and where now it is, and where it will or would be in the future. Unfortunately sometimes shareholders wouldn't be able to see the real picture. As a result of integrating both the communication and the performance management view of a social report, and the reporting process, makes it an un-imitated tool to inspire good corporate citizenship.

80 years ago U.S. Supreme Court Justice Louis Brandeis stated: "sunlight is the most effective of disinfectants". Today we have new regulations and new standards for financial reporting. During this research the scholar releases that the similar principle applies to non-financial reporting. In order to explain it in details that once companies start disclosing their performance, there is a horrific to improve that can be used to run a corporate citizenship. Transparency must drive both internal and external reporting only a conscientious account of performance, failures and successes, allows social reports to be effective.

Of course, an independent organization plays an important role in development and improving sustainable ideas for social reporting. As an example, the Global Reporting Initiative (GRI) offers the advanced methods for appraising social accountability. The Global Reporting Initiative (GRI) is the most internationally recognized voluntary sustainable development reporting organization. GRI constituted in 1997 by Coalition for Environmentally Responsible Economies (CERES) in partnership with United Nations Environment Program (UNEP) which involves many stakeholders including the Association of Chartered Accountants, numerous trans-national corporations, and the World Business Council on sustainable development.

Environmental cost management can be evaluated within the general concept of social accounting. Gray et al (2002) stated that social accounting or corporate social reporting is 'the process of communicating the social and environmental effects of organizations 'economic action to particular groups...' and as such involves 'extending the accountability of companies beyond the provision of financial accounting to the owners of capital, in mean of shareholders...'

CHAPTER 2

ENVIRONMENTAL MANAGEMENT ACCOUNTING

“Environmental Accounting” as a very broad term is often used to refer to the different types of accounting described above. Even within a particular subset of Environmental Accounting such as Environmental Management Accounting, terminology differs among organizations and countries. For example, Environmental Management Accounting has been variously called Environmental Accounting, Environmental Management Accounting, Environmental Cost Accounting, Full Cost Accounting, and Total Cost Assessment. Thus, in discussing any type of environment related accounting within an organization or elsewhere, it is important to clarify the definitions and the language being used.

Environmental Cost Management or Environmental Management Accounting (EMA) is a lack of standardized definitions of terminology. As an example, definition of environmental cost is still unclear. It was related to different types of interests. They include a variety of costs, such as investment costs and external costs. (External cost can be defined as a cost which occurs outside of the company.) Another significant point is that environmental costs are created from distorted data to improve self-expedience. There are tremendous numbers of projects aimed to prevent humankind environmental ecology (as emission decreasing, to use alternative-less harmful material to better utilization, and etc.) which are required in investments. These projects have long term feedbacks and on the other hand serious capital is necessary to actualize them.

These solutions cannot be applied as optimal as possible. Instead they are not recognized and not implemented. For example, to move factory plant to another area does not mean that it will prevent original area from pollution. Today lots of companies migrate or tend to migrate to low labor cost areas. Unfortunately, economic and ecological benefits to be derived from such precaution are not applied. Not only firms, also mankind are aware that producing waste and emissions is usually expensive than executing.

2.1. Environmental Accounting Context and Concepts

Environmental Accounting is a very general term that was used in a number of different contexts, such as:

- Assessment and disclosure of environment related financial information in the context of financial accounting and reporting;
- assessment and use of environment-related physical and monetary information in the context of Environmental Management Accounting ;
- estimation of external environmental impacts and costs, often referred to as Full Cost Accounting;
- accounting for stocks and flows of natural resources in both physical and monetary terms, that is, Natural Resource Accounting (NRA);
- aggregation and reporting of organization-level accounting information, natural resource accounting information and other information for national accounting purposes; and
- consideration of environment-related physical and monetary information in the broader context of sustainability accounting.

There are many linkages between Management Accounting and Financial Accounting activities. Besides there are also linkages between environmental Management Accounting and the content of environment related data in financial reports. For example, as a need for environmental content in financial reports increases, organizations can extract information for internal Environmental Management Accounting intentions in order to fulfill external reporting necessities. Environmental Accounting takes place in the context of both management accounting and financial accounting. Table 1 below provides a comparison of the environmental dimensions of financial and management accounting.

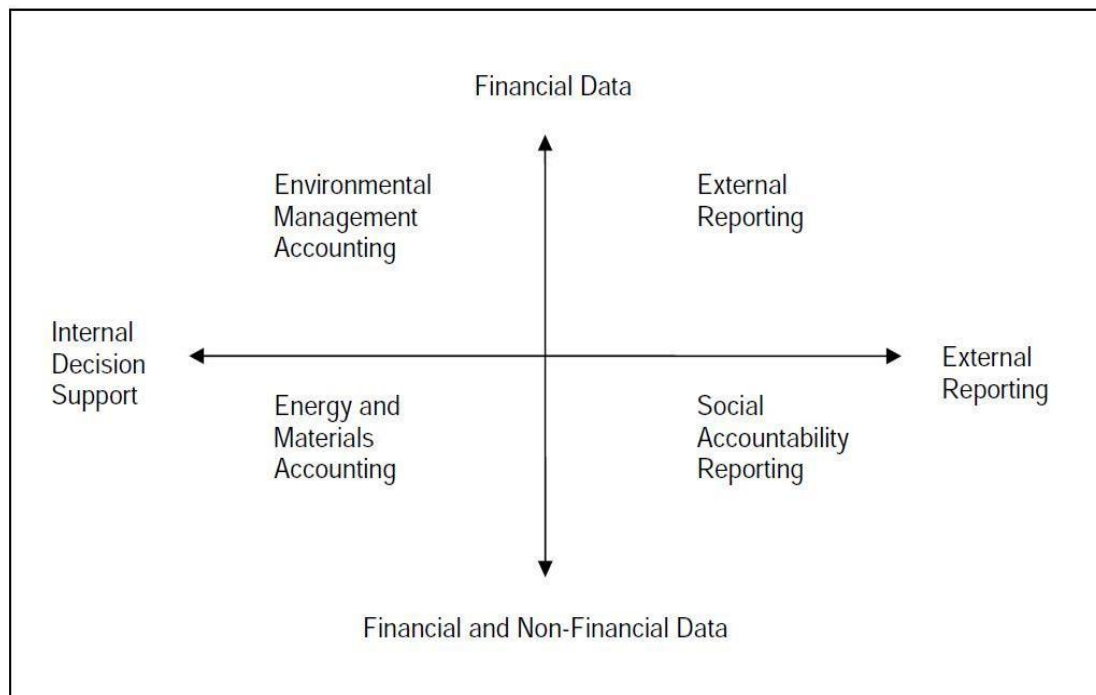
Bartolomeo et al. (2000) have investigated the links between environmental management and management functions of a company or business. They identified four broad but distinct approaches to environmental accounting from the literature:

Table 1: Organizational level Accounting and Reporting (IFAC, 2005)

Organization level Accounting	Organization-level Environmental Accounting	Associated MANDATORY External Reporting	OTHER External Reporting Links
<p>Financial Accounting (FA):</p> <p>An organization's development of standardized financial information for reporting to external parties (e.g., investors, tax authorities, creditors).</p>	<p>Environmental Issues in Financial Accounting:</p> <p>The inclusion in financial reports of environment related information such as earnings and expenses of environment-related investments, environmental liability and other significant expenses related to the organization's environmental performance.</p>	<p>Financial reporting to external parties is regulated by national laws and international standards, which specify how different financial items should be treated. The financial reports issued by organizations increasingly include information related to their environmental and social performance. Some countries require such content in financial reports, while some organizations include such information voluntarily.</p>	<p>In addition, organizations use some of the environment-related information gathered for financial reporting purposes for environmental regulatory reporting, national reporting or voluntary corporate environmental and sustainability reporting.</p>
<p>Management Accounting (MA):</p> <p>An organization's development of both nonmonetary and monetary information to support both routine and strategic decision-making by internal managers</p>	<p>Environmental Management Accounting (EMA):</p> <p>The management of environmental and economic performance via management accounting systems and practices that focus on both physical information on the flow of energy, water, materials, and wastes, as well as monetary information on related costs, earnings and savings.</p>	<p>There are generally no external reporting requirements specifically associated with MA or EMA.</p>	<p>However, organizations use some of the information gathered under EMA for environmental regulatory reporting, national reporting or voluntary corporate environmental and sustainability reporting.</p>

External Financial Reporting; Social Accountability Reporting; Energy and Materials Accounting; and Environmental Management Accounting. They classified these approaches as external and internal, financial and non-financial perspectives respectively according to Figure 2.

Figure 2. Environmental Management Accounting in relation to other approaches to environmental accounting in internal, external, financial and non-financial perspectives. (Bartolomeo et al., 2000).



Environmental impacts of organizational operations sometime be allowed by law, but the responsible organizations tries to control themselves strong away from punishment. For example, most environmental regulations allow some legal grade of pollution (emissions). This can negatively affect both the humans health and ecosystem. Because emissions are legal, anyhow the emissive companies do not have to manage those impacts. Regardless of the level of pollution allowed by law, emissions have harmful external effects. So most companies are not the only participator of such impacts, such as water quality of a river or the quality of air in the city, unfortunately most companies do not either estimate their contribution in monetary terms.

2.2. Environmental Management Accounting Definition

Environmental Management Accounting can be defined as the identification, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization. Thus environmental Management Accounting incorporates and integrates two of the three considerable elements of sustainable development, environment and economics as they related to an organization's internal decision making. Environmental Management Accounting is a relatively new tool in environmental management. Decades ago environmental costs were very low, so it seems better to include them in the overhead account for simplicity and convenience. Recently there has been a certain increase in all environmental costs, including energy and water prices as well as liabilities.

Environmental Management Accounting offers a combined approach which provides modulation of data from financial accounting and cost accounting to increase material efficiency, reduce environmental concussion and risk and reduce costs of environmental protection. Also United Nations Expert Working Group on Environmental Management Accounting, which works on explicit in details enlightens both physical and monetary sides of Environmental Management Accounting. This statement was established by international consensus of the group members, representing more than 30 nations.

Figure 3. Environmental Management Accounting combines monetary and physical data (Chritine Jasch and Hans Schinzer, 2002).

ACCOUNTING IN MONETARY UNITS		ACCOUNTING IN PHYSICAL UNITS	
	ENVIRONMENTAL MANAGEMENT ACCOUNTING		
MEMA MONETARY EMA		PEMA PHYSICAL EMA	

Environmental encompasses measurement in two different dimensions:

- Physical measurement of material- and energy input, material flows, products as well as wastes and emissions.
- Monetary measurement of costs, savings und earnings in relation to business activities with potential environmental effects.

According to International Federation of Accountants' statement "Management Accounting Concepts", Environmental Management Accounting is the management of environmental and economic performance through the development and implementation of appropriate environment related accounting systems and practices. While may include reporting and auditing in some organizations.

With this method hidden environmental costs and benefits can be specified and controlled that have a great potential to influence not only environmental performance but as a result also financial performance. Environmental Management Accounting metrics for internal decision-making include both physical metrics for material and energy consumption, flows, and final disposal, and monetary metrics for costs, savings, and revenues related to activities with a potential environmental impact. Key application fields for Environmental Management Accounting are (Jasch, 2003):

- Assessment of annual environmental costs or expenditures
- Product Pricing
- Budgeting
- Investment appraisal, calculating investment options
- Calculating costs and savings of environmental projects
- Design and implementation of environmental management systems
- Environmental performance evaluation, indicators and benchmarking
- Cleaner production and Eco-design projects
- External disclosure of environmental expenditures, investment and liabilities
- External environmental or sustainability reporting
- Other reporting of environmental data to statistical agencies and local authorities.

2.2.1. Environmental Management Accounting Physical Information (Waste Management and Performance Indicator)

A relatively simple application of Environmental Management Accounting that may dedicate large cost savings is waste management, as the costs of handling and disposing of waste are relatively easy to define and to allocate over specific products. Other environmental costs, including costs of regulatory compliance, damage to the corporate image, environmental liabilities and risks, are more difficult to assess. But, the extensive part of all environmental costs lies in the material purchase value of non-product output and can come up to 10 to 100 times the costs of disposal, depending on the business sector.

To assign costs correctly, an organization must collect not only monetary data but also non-monetary data on materials use, personnel hours and other cost making features. Environmental Management Accounting places a particular emphasis on materials and materials-driven costs because (M. Strobel, 2001):

- 1) use of energy, water and materials, as well as the generation of waste and emissions, are directly related to many of the impacts organizations have on their environments and
- 2) materials purchase costs are a major cost driver in many organizations.

Most organizations purchase energy, water and other materials to support their activities. It was observed that from a manufacturing point of view, some of the purchased material is converted into a final product that is delivered to customers. Most manufacturing operations also produce waste materials that were conceived to go into final product but became waste instead because of product design issues, operating inefficiencies, quality issues, and etc. Manufacturing operations also use energy, water and materials that are never conceived to go into the final product but are necessary to manufacture the product. Many of these materials eventually become waste flux that must be managed. Non-manufacturing operations can also use an important amount of energy, water and other materials to help run their

operations, depending on how those materials are managed, it can lead to a considerable generation of waste and emissions. For example, agriculture and livestock, resource extraction sector, service sector, transport, the public sector, and etc.

Thus, the most obvious example of materials-related environmental impacts is the generation of waste and emissions, which can affect the health of both humans and natural ecosystems, including plants and animals. Air, water or land can end up polluted or even contaminated.

The second broad area of materials-related environmental impact is the potential impact of the physical products (including by-products and packaging) produced by a manufacturer. Some of the potential environmental impacts of products can be reduced by changes in product design (*Life-cycle costing*), such as decreasing the volume of paper used in packaging or replacing a physical product with an equivalent service, etc. In many manufacturing plants, most of the materials used become part of a final product rather than part of waste or emissions. As a result, the potential environmental impact of products is high, and the potential environmental benefit of product improvements is coincidentally high.

Pursuing and reducing the amount of energy, water and materials used by manufacturing, service and other companies can also have indirect environmental benefits upstream, because the subtraction of almost all raw materials has environmental impacts. For example, activities such as extraction of harmful substance and other minerals from field and inconsistence irrigation of farm field adding some catalyst chemicals, and etc. can have extreme impacts on the environment surrounding extraction sites. These impacts include not only the pollution and waste generated during extraction operations, but also the erosion or outright removal of topsoil and vegetation, sedimentation of nearby water bodies and the disruption of wildlife feeding, reproduction and migration habitat. As well, there are impacts on the local human populations that depend on the affected ecosystem for food and clean water. The depletion of non-renewable or slowly renewable natural resources can also be considered as a cause.

In order to effectively manage and reduce the potential environmental impacts of waste and emissions, as well as of any physical products, an organization must have accurate data on the amounts and destinations of all the energy, water and materials used to support its activities. It needs to know which and how much energy, water and materials are brought in, which become physical products and which become waste and emissions. This physical accounting information does not provide all of the data needed for effectively managing all potential environmental impacts, but is essential information that the accounting function can provide.

In the scope of physical accounting of Environmental Management Accounting, an organization should try to track all physical inputs and outputs and assure that no significant amounts of energy, water or other materials are not taken into consideration. The accounting for all energy, water, materials and wastes flowing into and out of an organization is called a “materials balance,” sometimes also referred to as “input-output balance,” a “mass balance” or an “eco-balance.” Many organizations perform energy balances and water balances separately from other materials balances. In the scope of this terminology, the underlying estimation is that all physical inputs must eventually become outputs either physical products or waste and emissions and the inputs and outputs must balance. The level of precision of a materials balance can differentiate from each other, depending on the specific intention of the information collection, the availability and the quality of the data.

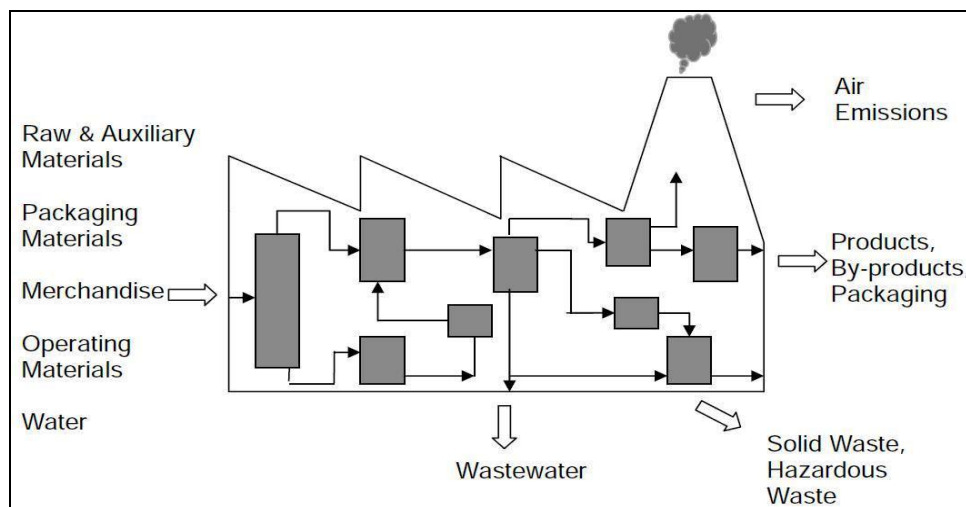
Materials balances can take place at many different levels. The physical information can be collected for the whole organization, or for particular sites, input materials, waste fluxes, processes or equipment lines, product or service lines, etc., depending on the intended use of the information. Ideally, the materials balances done on more detailed levels would piece together to match a materials balance done for a site or organization as a whole. In practice, however, materials balances at different levels often are not cross-checked and, therefore, are not logical.

For a complete and integrated picture of materials use, the details of materials flows must be traced through all the different organizational materials management

steps, such as materials supply, delivery, inventory, internal distribution, use and product shipping, as well as waste collection, recycling, treatment and disposal, all with the materials balance numbers attached. This type of accounting can be referred to as “materials flow accounting” as presented in figure 4.

Once the physical accounting data have been collected, they can be used to support the cost accounting side of Environmental Management Accounting and to create Environmental Performance Indicators that help an organization to assess and to report the materials-related aspects of its environmental performance. Even organizations that do not have the specialization or resources to perform comprehensive materials balances or materials flow accounting can benefit greatly from the estimation of key Environmental Performance Indicators.

Figure 4. Materials Flow Accounting (IFAC, 2005)



Environmental Performance Indicators can be calculated at many different levels for the organization as whole, for specific products or product lines, for specific material groups, depending on the intended use of the information. For example, a local community might be most interested in wastewater generation rates for a facility as a whole, while internal managers would also be interested in wastewater generation rates for specific process lines in order to make process improvements.

Materials Inputs are any energy, water or other materials that enter an organization. Outputs are any products, wastes or other materials that leave an organization. Any Output that is not a Product Output is by definition a Non-Product Output. In organizations that use energy and materials but do not manufacture physical products, such as transport or other service sector companies, all energy, water and other materials used will eventually leave as Non-Product Output, by definition. Also scholars names Non-Product Output as “Waste and Emissions.” and Table 2 describes each type of Input and Output.

Table 2. Physical Materials Accounting: Input and Output types (IFAC,2005)

Materials Inputs	Product Outputs
Raw and Auxiliary Materials	Products (including Packaging)
Packaging Materials	By-products (including Packaging)
Merchandise	Non-Product Outputs (Waste and Emissions)
Operating Materials	Solid Waste
Water	Hazardous Waste
Energy	Wastewater
	Air Emissions

2.2.2. Environmental Management Accounting Monetary

Information (Cost Types, Cost Categories, Cost Assessment)

Environment-related costs under Environmental Management Accounting include not only environment protection expenditures’, but also other important monetary information needed to supervise cost-effective environmental performance. One important example is the purchase cost of materials that become waste or emissions. Another latest development in the area of Environmental Management Accounting is the tendency to view the purchase costs of all natural resources as energy, water, materials which are related to environment. In a manufacturing frame, where most of the purchased materials are converted into physical products, this would allow more cost-effective management of the materials’ environmental

impacts of those products. Of course, organizations evaluate materials purchase costs in their internal management decision making, but do not necessarily view them as a point which was related to environment. These costs could be related to environment, because an organization must have this information to fully assess the financial aspects of the environmental management related to both physical waste and physical products. The physical accounting side of Environmental Management Accounting provides the necessary information on the amounts and flows of energy, water, materials and wastes to assess these purchase costs.

Unfortunately today's Environmental Management Accounting do not include "external" costs, the environment-related costs incurred by individuals, business partners, society or the planet for which organizations are not legally responsible. Some organizations consider such external costs, however, and the boundary between internal and external environmental costs is becoming increasingly fluid, both because of changing environmental regulations and a growing emphasis on corporate social responsibility. Environmental cost has at least two major formats: First, it involves costing that directly concerns company's private costs. Second, it can surround the cost to the society as societal cost. "COST" information is considered with a high sensitivity by the companies. Identifying accurate costs affects the process of decision making. Once the costs have been identified, companies can analyze the cost drivers and evaluate alternative cost reduction opportunities. (IFAC, 2005)

Eventually, the first step of the decision making process should be identifying the costs. Environmental costs are classified by Environmental Protection Agency is as follows (EPA, 2004):

- **Conventional Costs:** includes such as decreased use and less waste of raw materials, costs of using environmentally preferable supplies, costs of reducing consumption of non-renewable resources.
- **Potential Hidden Costs:** are the costs that are either incurred in the past operations or related to ongoing operations or future operations that may be potentially hidden under exaggerated and overhead accounts.

- **Contingent Costs:** are the costs that may or may not be incurred at some point in the future. They can be expressed with their expected value or range or probability of their exceeding some dollar unit. Examples can be future accidental release of contaminants in to the environment.
- **Image and Relation Costs:** are the environmental costs that are less tangible or intangible. Examples can be costs of annual environmental reports and community relation activities.

Fundamentally, the main problem of Environmental Management Accounting is the need for a standardized definition of environmental accounting costs. Essentially tracing costs under general overhead accounts damages the main aim of Environmental Management Accounting system. Hence, the most important point is to avoid these un-systematical allocations over to processes and products.

Conventional accounting systems classify the costs as direct material, direct labor, manufacturing overhead. The corporate calculation model support calculation of environmental costs for corporations that comprise all activities needed for legal adaption and adaption with community. This includes costs for prevention, disposal, control, shifting actions and damage repair that can occur in companies. Especially, environmental costs are hidden under overhead accounts and generally difficult to trace within traditional accounting techniques. Under these systems, overhead costs are allocated on a specific basis to the products or they are accumulated in a pool of costs. When overhead costs are allocated by taking a base like direct labor hours or machines hours, this may result inaccurate costing of products. But for cost reduction or to achieve other benefits it is very important to allocate environmental costs properly. When firms produce more than one product and with different environmental costs, traditional cost accounting techniques often does not accurately represent the cost of each product. Too little environmental cost may be allocated over dirty products and high over clean products (Perego, 2003).

At this point cost clarification will be necessary through a new technique to identify and allocate environmental costs properly. For example, *Activity Based*

Costing is a costing method that can assist companies by tracing costs to product properly within a cause and effect relationship (Esra ASLANERTIK, 2007).

Corporate environmental protection expenditures includes expenditures for measures of environmental protection of a company or what it is responsible to prevent, reduce, control, coordinate and document environmental aspects as impacts and hazards as well as disposal, treatment, sanitation and clean up expenditure, as seen in table 3 (Jasch, 2003):

Table 3. Total corporate environmental expenditure principle calculation (Jasch, 2003)

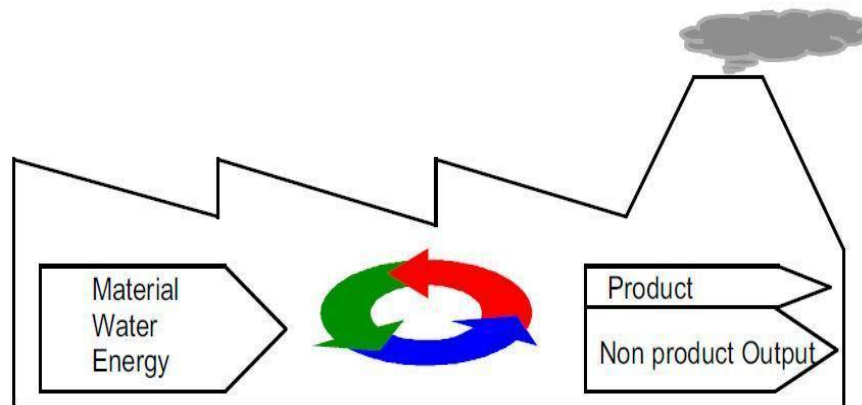
Environmental Protection Expenditure (Waste Disposal and Emission Treatment, Environmental Management and Pollution Prevention)
+ Costs of wasted material
+ Costs of wasted capital and labour
= Total corporate environmental costs

Also according to VDI, German Association of Technicians (2000) scholar's stated that environmental costs comprise both internal and external costs and relate to all costs occurred in relation with environmental damage and protection. Environmental protection costs include costs for prevention, disposal, planning, control, shifting actions and damage repair that can occur at companies, governments or people.

Within the company, internal calculation of environmental costs or expenditures for environmental protection is only one part of the whole system. The costs of waste and emissions include much more then the respective treatment facilities and disposal fees. From a business perspective, it is necessary to minimize Environmental Costs, but it doesn't means to declare off environmental protection. This makes sense from a micro and well as macroeconomic perspective.

Material flows are money flows and can be partly traced by traditional accounting systems. Also, when calculating investments for environmental protection, increased material and production efficiency needs serious consideration.

Figure 5. Material flows are Money flows (Christine Jasch and Hans Schitzer, 2002)



The basis of environmental performance improvements as mentioned before depends on the recording of material flows in kilograms by an input-output analysis. The system boundaries can be on the corporate level, or further split up to sites, cost centers, processes and product levels. With rising costs for environmental compliance, disposal and the need to improve material efficiency in strongly competitive markets, tracking and tracing material flows throughout the company has been the major tool for detecting potential improvements in waste prevention and cleaner production. Likewise, calculating the related environmental costs and distributing them back to the polluting cost centre, process or product (polluter pays principle, also in cost accounting) has gained importance for the correct calculation of the profitability of products, processes and production sites. The material flow balance is an equation based on “what comes in must go out - or be stored”. In a material flow balance information on both the materials used and the resulting amounts of product, waste and emissions are stated. All items (materials always comprising materials, water and energy input) are measured in physical units in terms of mass (kg, t), liters or energy (MJ, kWh). The purchased input is cross-checked with the amounts produced and sold as well as the resulting waste and emissions. The goal is to improve efficiency of material management both economically and environmentally. (Dimitroff, Jasch and Schnitzer, 1997)

Figure 6. Material and Money flow in a paint shop (Dimitroff, Jasch and Schnitzer, 1997).

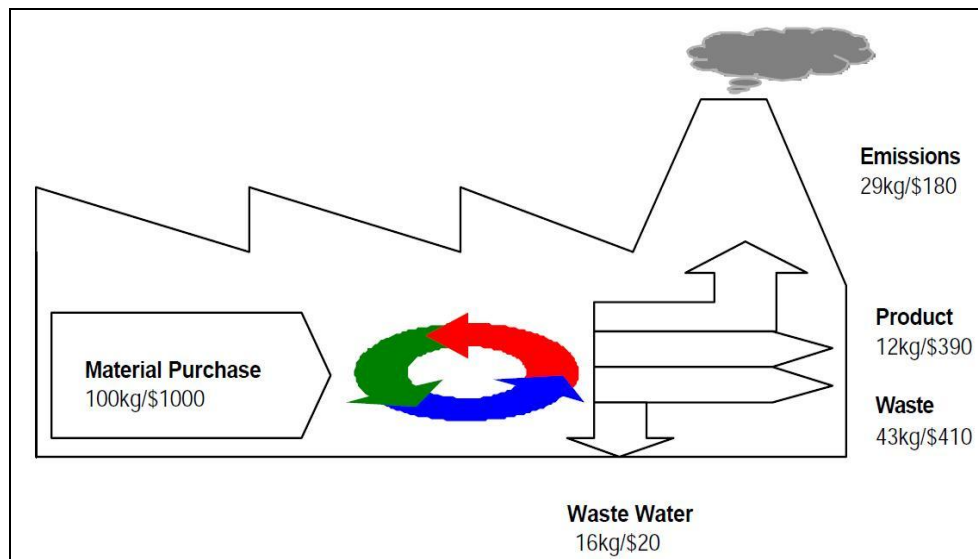


Figure 6 shows the generally applicable structure of the input-output balance at the corporate level, which should also be used for environmental reporting. Specific subcategories will be needed for different sectors, but, it should always be possible to aggregate in a standardized manner, in order to be able to compare them.

Similar to the physical information collected under Environmental Management Accounting, monetary data can be collected for an organization as a whole. Input materials, waste streams, process or equipment lines, product or service lines, depending on the purposed use of the information. For example, investment appraisal, assessment of total annual costs or budgeting. Some organizations may wish to enlarge their boundaries system beyond their own operations. Supply Chain Environmental Management and Lifecycle Assessment and Costing should take into consideration monetary information from suppliers, customers and other elements of the supply chain, or the product and service life cycle.

For example, cost schemes tend to use the following four types of cost categories (IFAC, 2005):

- categories reflecting the type of environmental activity (such as waste control vs. waste prevention);
- categories more representative of traditional accounting (such as materials vs. labor);

- environmental domain categories (such as water vs. air vs. land); and
- categories reflecting data visibility in the accounting records (such as obvious costs vs. hidden costs).

For this research, set of different categories of cost was investigated by reviewing set of different international sources. The main aim was to develop a set of cost categories that represents not only widely accepted international practice, but also emerging best practice. Considering this, Table 4 defines a set of environment-related cost categories.

For the assessment of corporate environmental expenditures, the environmental cost assessment scheme can be used which provided by the United Nation Expert Working Group, that can be seen in table 5. Annual expenses are the best available data source to begin with. Then diversifying into cost centers, processes, products and material flow balance can rather be done in step by step procedures through which the information system's improvement (Jasch, 2003).

The cost assessment scheme integrates cost associated with environment in a structured way so they become visible and can be managed because it allocates them both to the effected environmental media and to what causes the costs, a responsibility or a cause, that become visible in detailed environmental cost assessment.

The cost assessment reveals improvement options in two areas (Jasch, 2002):

1. What always can be found, are options and measures necessary to improve the quality and consistency of data and information flows in an organization. This is the starting point of most projects and the focus of most follow up projects.
2. In companies, that have not done environmental management projects for several years, also technical improvement options may become obvious. What always is made visible, mostly for the first time, are the costs related to inefficient production, wasting materials and energy. So even if

the technical solution might not be known at the end of the first assessment, the priority areas for deeper investigation will have been defined.

Table 4. Environment related cost categories (IFAC, 2005).

<p>1. Materials Costs of Product Outputs</p> <p>Includes the <i>purchase costs</i> of natural resources such as water and other materials that are converted into products, by-products and packaging.</p>
<p>2. Materials Costs of Non-Product Outputs</p> <p>Includes the <i>purchase (and sometimes processing) costs</i> of energy, water and other materials that become Non-Product Output (Waste and Emissions).</p>
<p>3. Waste and Emission Control Costs</p> <p>Includes costs for: <i>handling, treatment and disposal</i> of Waste and Emissions; <i>remediation and compensation</i> costs related to environmental damage; and any control-related <i>regulatory compliance</i> costs.</p>
<p>4. Prevention and Other Environmental Management Costs</p> <p>Includes the costs of <i>preventive environmental management activities</i> such as cleaner production projects. Also includes costs for <i>other environmental management activities</i> such as environmental planning and systems, environmental measurement, environmental communication and any other relevant activities.</p>
<p>5. Research and Development Costs</p> <p>Includes the costs for <i>Research and Development</i> projects related to environmental issues.</p>
<p>6. Less Tangible Costs</p> <p>Includes <i>both internal and external</i> costs related to less tangible issues. Examples include <i>liability, future regulations, productivity, company image, stakeholder relations and externalities</i>.</p>

Table 5. Environmental Cost Assessment scheme (Jasch, 2003).

Environmental media Environmental cost/expenditure categories	Air+Climate (Energy)	Waste Water	Waste	Soil+Ground Water	Noise+ Vibration	Biodiversity+ Landscape	Radiation	Other	Total
1. Waste and Emission treatment									
1.1. Depreciation for related equipment									
1.1.1. EoP - equipment									
1.1.2. Non-BAT equipment									
1.2. Maintenance and operating materials and services									
1.3. Related Personnel									
1.4. Fees, Taxes, Charges									
1.5. Fines and penalties									
1.6. Insurance for environmental liabilities									
1.7. Provisions for clean up costs, remediation									
2. Prevention and environmental management									
2.1. External services for environmental management									
2.2. Personnel for general environmental management activities									
2.3. Research and Development									
2.4. Extra expenditure for IPPC equipment									
2.5. Other environmental management costs									
3. Material Purchase Value of nonproduct output									
3.1. Raw materials									
3.2. Packaging									
3.3. Auxiliary materials									
3.4. Operating materials									
3.5. Energy									
3.6. Water									
4. Processing Costs of non-product output									
Σ Environmental Expenditure									
5. Environmental Revenues									
5.1. Subsidies, Awards									
5.2. Other earnings									
Σ Environmental Revenues									

2.3. Environmental Management System

Perez et al. (2007) explore how catalyst for change that stem from European Community Eco-Management and Audit Scheme could enable the embedding for environmental issues and values in organizations, through the creation of different intangible assets. They discuss: training and awareness of developing; continuous environmental improvement; integrating stakeholder's interests; and, organizational learning as catalysts.

Two critical intangible assets are developed from the exploration of training and awareness building: the awareness of employees, and the environmental knowledge, skills and expertise of employees. Other two intangible assets have emerged from the analysis of continuous environmental improvement, the integration of environmental issues in the strategic planning process and the use of management accounting practice. Five key intangible assets are evidenced from the analysis of integrating stakeholders' interests and organizational learning:

- The commitment of managers
- The cross-functional coordination
- The cross-functional communication
- The integration of environmental issues in the strategic planning process
- The use of management accounting practices on the environmental knowledge, skills and expertise of employees.

Perez et al. (2007) classify these intangible assets in three defined levels of environmental embeddedness according to figure 7.

The first, primary, level of embeddedness is based on the need to keep the Environmental Management System alive, assuring a minimum level of continuous environmental performance improvement. A second, visible, level of embeddedness is characterized by further influence of environmental issues over organizational structures and strategies. The third, advanced, level of embeddedness is characterized by the existence of intangible assets that guarantee the integration of environmental issues over time. This level include the use of management accounting practices as

emerging costs systems, capital budgeting, scorecards and other advanced management accounting practices. This implies formal and informal interactions between different functions that enable the sharing of environmental information which stimulate the use of management accounting practices for further embeddedness. (Perez et al., 2007)

Figure 7. Levels of environmental embeddedness (Perez et al., 2007).

PLACEMENT OF SITES AMONG THE LEVELS OF EMBEDDEDNESS		Indicators of environmental embeddedness					
		Awareness of employees	Environmental knowledge, skills and expertise of employees	Commitment of managers	Cross- functional coordination and communication	Integration of environmental issues in strategic planning process	Use of management accounting practices
Levels of embeddedness	Primary	AA, BB, EE					
	Visible	CC, DD, GG, HH, II					
	Advanced	FF, JJ					

2.4. Benefits of Environmental Management Accounting

Actually Environmental Management Accounting is a very important tool for internal management initiatives. Environmental Management Accounting focused on such items as cleaner production, supply chain management, “green” product or service design, environmentally better purchasing and environmental management systems. Today’s practices shows that Environmental Management Accounting information is increasingly being used for external reporting purposes. Thus, Environmental Management Accounting not used only for one environmental management tool but among many types. Environmental Management Accounting comprises the set of principles and approaches that provides the data essential to the

success of many other environmental management activities. Since the scope of decisions affected by environmental issues is diffusing, Environmental Management Accounting is becoming more significant tool, not only for environmental management decisions, but for all types of management activities.

The range of uses and benefits of Environmental Management Accounting are wide, but it can be organized into three broad categories, as illustrated below in figure 8. The importance of Eco-efficiency and Strategic Position in two of the categories parallel the overall evolution of management accounting to include not only information preparation and also management planning and control. The strategic focus of Environmental Management Accounting can, however, vary widely among different organizations.

Companies and managers usually believe that environmental costs are not very important for the operating consistency of their businesses. For instance, the purchase price of raw materials: the unused portion that is emitted in a waste is not usually considered an environmentally related cost. These costs tend to be much higher than initial estimates and should be controlled and minimized by the introduction of effective cleaner production initiatives on every occasion as possible. By identifying and controlling environmental costs, Environmental Management Accounting systems can help environmental managers in explaining for these cleaner production projects, and identify new ways of saving money and improving environmental performance at the same time. (UNSD: Improving Government's Role in the Promotion of Environmental Managerial Accounting, United Nations, New York, 2000)

The systematic use of Environmental Management Accounting (EMA) principles will assist managers in identifying environmental costs often hidden in a general accounting system. When hidden, it is impossible to know what share of the costs is related to any particular product or process or is actually environmental. Without the ability to isolate and separate this portion of the overall cost from that of production, product pricing will not reflect the true costs of its production. Polluting

products will appear more profitable than they actually are because some of their production costs are hidden, and they may be sold under cost. Cleaner products that bear some of the environmental costs of more polluting products (through the overhead), may have their profitability underestimated and be over costed. Since product prices influence demand, the perceived lower price of polluting products maintains their demand and encourages companies to continue their production, perhaps even over that of a less polluting product.

Finally, implementing environmental accounting will multiply the benefits gained from other environmental management tools. Besides the cleaner production assessment, EMA is very useful for example in evaluating the significance of environmental aspects and impacts and prioritizing potential action plans during the implementation and operation an environmental management system (EMS). EMA also relies significantly on physical environmental information. It therefore requires a close cooperation between the environmental manager and the management accountant and results in an increased awareness of each other's concerns and needs. As a tool, EMA can be used for product, process or investment project decision-making. Thus, an EMA information system will enable businesses to better evaluate the economic impacts of the environmental performance of their businesses. (UNSD: Improving Government's Role in the Promotion of Environmental Managerial Accounting, United Nations, New York, 2000)

An organization's decision-makers can use the physical flow of information and cost information provided by EMA to give decisions that impact both the environmental and financial performance of the organization. Both private business and government organizations can benefit. (Resource and Environmental Strategies, Tellus Institute)

Benefits of EMA to Industry (Resource and Environmental Strategies, Tellus Institute):

- The ability to more accurately track and manage the use and flows of energy and materials, including pollution/waste volumes, types, and fate

- The ability to more accurately identify, estimate, allocate, and manage/reduce costs, particularly environmental types of costs
- More accurate and comprehensive information for the measurement and reporting of environmental performance, thus improving company image with stakeholders such as customers, local communities, employees, government, and finance providers

Benefits to Government of EMA Implementation by Industry (Resource and Environmental Strategies, Tellus Institute):

- The more that industry is able to justify environmental programs on the basis of financial self-interest, the lower the financial, political, and other burdens of environmental protection on government.
- Implementation of EMA by industry should strengthen the effectiveness of existing government policies/regulations by revealing to companies the true environmental costs and benefits resulting from those policies/regulations
- Government can use industry EMA data to estimate and report financial and environmental performance metrics for government stakeholders such as regulated industries or the industry partners in voluntary programs.
- Industry EMA data can be used to inform government program/policy design.
- Industry EMA data can be used for regional or national-level accounting purposes.

Benefits of Government Implementation of EMA (Resource and Environmental Strategies, Tellus Institute):

- Government EMA data can be used for environmental and other decisions within government operations, e.g., purchasing, capital budgeting, and federal facility environmental management systems.
- Government EMA data can be used to estimate and report financial and environmental performance metrics for government operations.

2.5. Environmental Aspects in the Financial Statements

(Balance sheet and Income Statement)

The function of financial accounting is to provide a corporate database and to prepare the financial statement. The annual financial statements consist of balance sheet (as statement of financial position, statement of retained earnings, and statement of cash flows), profit and loss accounts, and manage report. Financial statements are submitted annually and must comply with regulatory assessment rules, with a distinction as regards their function being made between commercial and tax balance sheets.

From commercial perspective to balance sheet coming upon interesting facts, as entrepreneurs pretend if needed to increase their profit and look as poorer than they actually are, and poorer than the tax balance sheet would be which as a basis for tax assessment is intended to ensure as much as possible an equitable national tax revenue based on economic performance. The balance sheet is the combination of company assets on the one side, and on the other side debt and equity. It was based on the value determined in categories and arranged in the form of accounts or in series at a given cut-off date or balance sheet day.

Balance sheet should be supported with profit and loss statement which contains all expenses and earnings incurred in a one year. The disclosures and the management report give an explanation of figures, a description of the assessment methods used and an outlook on the economic situation of the company.

Every accounting transaction is entered into two accounts. The systematic structure of accounts depends on the so-called chart of accounts, which functions as a requisite classification and organization system for consistency of bookkeeping. The chart of accounts is structured in the logic of the balance sheet and the profit and loss accounts. The structure of the standard chart of accounts is shown in table 6.

Due to the uniform chart of accounts, expenditure for energy, waste disposal or detergents is posted by most bookkeepers into accounts with similar numbers. The

standard chart of accounts thus has some similar points with the periodic table of elements.

Figure 8. Use and Benefit of Environmental Management Accounting (Berlin: German Environment Ministry, 2003).

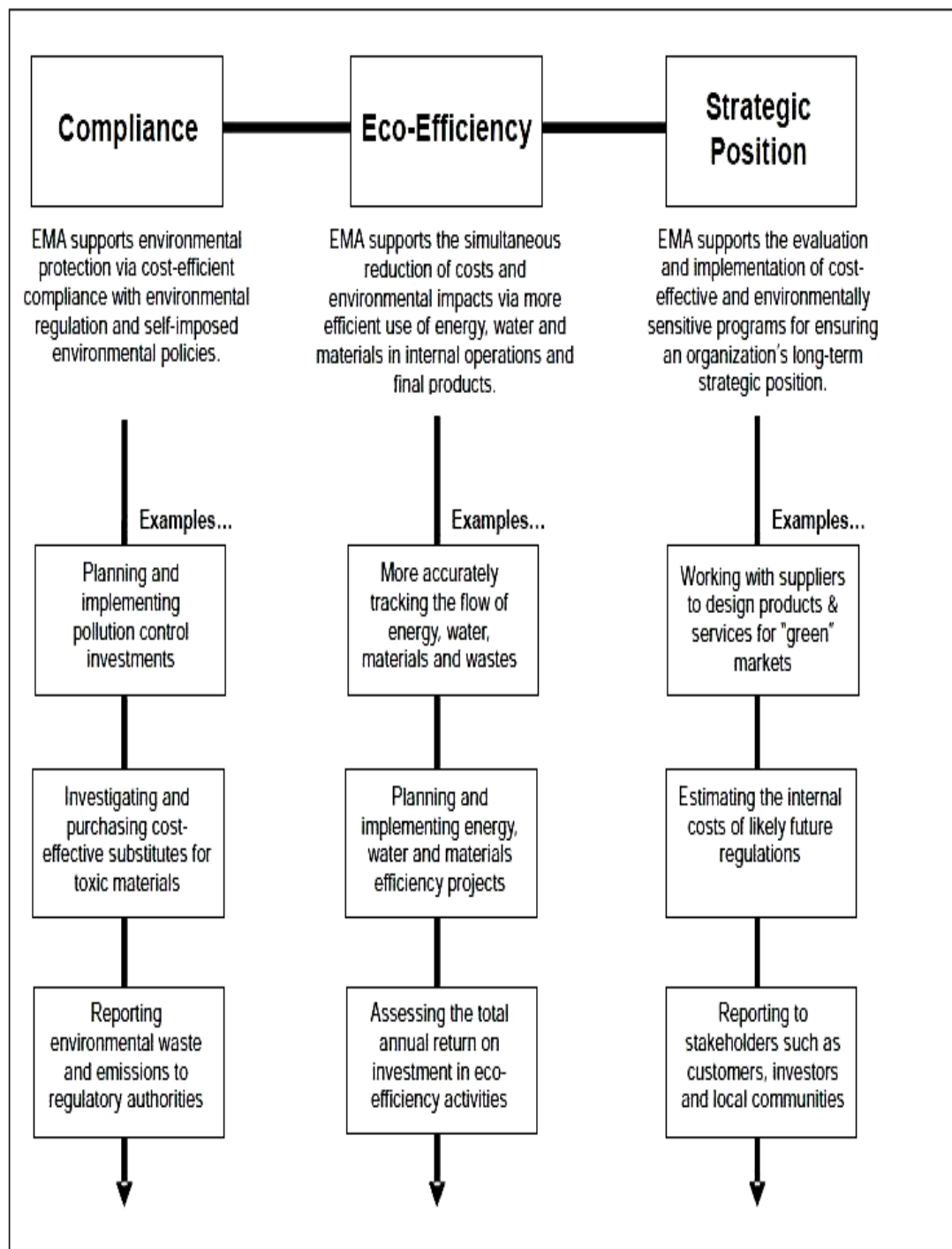


Table 6. Structure of the chart of accounts (*“EMA Procedures and Principles”*, United Nations, New York, 2001).

Class of accounts	Content	Allocated to
0	Fixed sssets	Balance sheet
1	Stocks	
2	Other current assets and deferrals	
3	Provisions, accounts payable and deferrals	
4	Operating earnings	Profit and loss accounts
5	Material expenditure and services received	
6	Labour costs	
7	Depreciation and other operating expenses	
8	Financial earnings and expenses, taxes	Balance sheet
9	Equity capital, reserves, closing accounts	

Every business transaction is posted into two accounts, e.g., rental expenses paid via the company’s bank or as a receivable from customers against the revenue account. The account thus shows all entries posted in the course of a year. The list of balances shows the sum of total of all accounts and gives the best overview, and there is no aggregated representation like the one in the financial statements. The environmental cost assessment scheme mentioned before, is based on the determination of annual environmental expenditure and thus relies mainly on the data derived from the profit and loss accounts.

Below is a short representation of the structure of a financial statement from which a combination with the environmentally relevant data may subsequently be derived. The balance sheet is a cut-off date comparison of assets and liabilities as at 31 December from which the annual profit is derived. The debit side of the balance sheet shows the purposes for which the funds were used in the company (investments) while the credit side shows the origin of these funds (financing). Equity capital (funds provided by the owner) is the balance between assets (investments, receivables, etc.) and borrowed capital. The balance sheet equation thus reads as follows:

$$\text{Assets} - \text{Liabilities} = \text{equity, or}$$

$$\text{Assets} = \text{Liabilities} + \text{equity}$$

This balance sheet equation is the basis from which the entire system of double-entry bookkeeping is derived.

Table 7. Structure of Balance Sheet.

Balance sheet on 31 December

Class of accounts	Assets accounts (credit)	Class of accounts	Liability account (debit)
0	<u>Fixed assets</u>	9	<u>Equity capital</u> Reserves Profits
1	<u>Current assets</u> Stocks	3	<u>Borrowed capital</u> Provisions
2	Receivables		Account payable
2	Cash and bank balances		Deferred items

The credit side of the balance sheet shows the assets valued in monetary terms on the cut-off date. The debit side shows the funds used by the company, the financial resources, which are divided into equity or borrowed capital in other words debt.

The values for the balance sheet are obtained from the stock taking process which takes place on the cut-off date and which comprises all assets and debts of a company based on quantity and stated in monetary terms.

Income statement, also referred as profit and loss statement, statement of financial performance, earnings statement, operating statement or statement of operations, is a company's financial statement that indicates how the revenue, money received from the sale of products and services before expenses are taken out, also known as the *top line*, is transformed into the net income, the result after all revenues and expenses have been accounted for, also known as the *bottom line*. It displays the revenues recognized for a specific period, and the cost and expenses charged against these revenues, including write-offs (e.g., depreciation and amortization of various assets) and taxes. The purpose of the income statement is to show managers and investors whether the company made or lost money during the period being reported. The important thing to remember about an income statement is that it represents a

period of time. This contrasts with the balance sheet, which represents a specific period in time.

The Income Statement (profit and loss statement) may be arranged according to the expenditure or cost categories oriented format or to the operational (*cost-of-sales*) format. In the cost categories oriented format, all earnings and expenses of a period are listed. Operational expenditure is divided into material and personnel expenditure, depreciation and other expenses. The accumulation and clearance of work in process and finished goods is determined by stock taking at the end of year, assessed at production cost and posted as correction of sales revenue (UN, New York, 2001).

In the cost-of-sales format, the actual sales of a period are compared only to those expenses which have been created for the manufacture of the products sold. The cost-of-sales format, therefore, requires a constant collection and assessment of inventory increases of finished products and work in process. The monthly earnings statement thus leads to a more clear defined operating result than the cost categories oriented format in which the changes in inventory are not recorded during the year although it is more advanced and time consuming in terms of the cost accounting system used. The *cost-of-sales* format is structured differently and distinguishes between production costs of sales, and hierarchically separates distribution costs, administrative costs and other operating expenses. The profit for the year is identical in both formats (UN, New York, 2001).

Under coordination of United Nations (New York, 2001) scholars examined in the following table, which items of the profit and loss account must be analyzed for the roll-over of environmental costs and under which items of the environmental cost scheme they are allocated. The cost categories oriented format is better suited for this purpose as the list of balances of the bookkeeping department contains all the necessary information. In the *cost-of-sales* format, an analysis of both the accounts of the bookkeeping department and of detailed cost evaluations must be performed in order to determine the environmental costs.

The *cost-of-sales* format allows certain retardation in the calculation of production costs as regards the inclusion of overhead costs of production. Material and production related direct costs and special direct costs of production are always shown under production costs. Material related direct costs include raw and assistant materials as well as packaging materials allocated directly to a product, depending on the cost-accounting system used. Production related direct costs comprise wages in production, allocated according to work hour records and cost centers. Material and production-related overhead costs, as other labor costs, operating materials, and depreciations for production plants, may be posted under production costs or under the item other operating expenditure. To be able to determine the appropriate share of non-product output, a rather detailed breakdown together with the cost accounting system used by the company must be provided (UN, New York, 2001).

Table 8. Cost-categories-oriented format (UN, New York, 2001).

Cost-categories-oriented format	To do	Shown under item
Turnover/net sales	Determine actual quantities produced, sales figures, loss in storage, spoilage, returns etc. Establish actual product output and loss of products between production and sales	1.4, 3, 4
- Change in inventory	The quantities of non-product output between finished goods storage and sales department are posted at their material values (3), pro-rata production costs (4) and disposal costs (1.4)	
- Work performed and capitalized	May be relevant for production costs of in-house facilities for the removal, treatment and prevention of wastes and emissions	1.1, seldom 2.3
Other operating income	Revenue from subsidies, grants and sales of non-product output	5
- Materials	Determine share of non-product output of raw, auxiliary and operating materials and assess at material purchase costs; Energy and water supply costs should also be shown in this category, but are often posted under "other operating expenditure"	3
-Services (other external costs)	External services for maintenance of treatment facilities and cleaner technologies, general environment research and consultancy services, auditors, seminars, external information and communication etc. are scattered across a variety of accounts	1.3, 2.1
- Personnel expenses	Determine work hours of staff in emission treatment facilities, cleaner technologies, general environmental management activities and labor pro rata cost for non-product output in the various phases of processing. Assessment is not derived from expense accounts of bookkeeping unit but according to work hour rates as established by the internal calculation procedures.	1.3, 2.2, 4
- Depreciation	Define waste and emission treatment equipment. Search cleaner technologies and determine if they have been significantly more expensive in relation to state of the art; Determine related pro rata production costs and pro rata administrative costs for non-product output	1.1, 2.3, 4
- Other operating expenses	Transport expenditure for wastes, disposal and collection fees, licenses, printing costs for environmental reporting, registration fees, eco-sponsoring, penalties, insurance premiums, provisions etc. are scattered across a variety of accounts. The checklists included in the annex are designed to assist the user in tracing and assessing costs; Also purchases of power, fuel and water can sometimes be found in this category, even though they belong under "materials"	1.4, 1.5, 1.6, 1.7, 2.3, 2.4
-Other taxes	Environmental taxes, disposal and connection fees should be posted under this item	1.4
= Operating profit, EBIT earnings before interest and tax		

Cost-categories-oriented format	To do	Shown under item
+/- Financing	Not relevant; if environmental costs are assessed instead of expenditure, pro rata financing cost for depreciation of fixed assets may be calculated	
= Profit (loss) on ordinary activities (after financial items and before tax)		
+/- Extraordinary results	Not relevant, except in the case of breakdowns and accidents and sudden discoveries of contaminated sites	1.4, 1.5
Taxes on income and earnings	Not relevant	
= Net earnings /Profit after tax		

Table 9. Cost-of-Sales format (UN, New York, 2001).

Cost-of-sales format	To do	Shown under item
Sales revenue	Not relevant	
- Production costs of services supplied to achieve sales revenue	Determination of non-product output and production costs. Breakdown according to accounts and items of environmental cost assessment scheme on the basis of cost accounting documents.	3, 4
= Gross earnings from sales		
- Distribution costs	May also include costs of the environment report and other communication media.	2.4
- Administrative costs	Analysis of accounts according to expenses for items 1 and 2.	1, 2
Other operating revenue	Check subsidies for environmental measures and revenue for residual materials sold.	5
- Other operating expenditure	Analysis of accounts according to expenses for items 1 and 2.	1, 2
- Other taxes	Environmental taxes, disposal and sewage fees should be posted under this item.	1.4
= Operating result		

CHAPTER 3

LITERATURE REVIEW FOR CASE STUDY

As organizations have started to incorporate environmental issues conventional strategic and operational decisions, over the last decade research interests in organizational greening have intensified. Initial examples of the environmental management literature appeared in books or journals whose specific subject is environmental related, or having been written for a practitioner audience. Examples of this literature include early editions of *Business Strategy and the Environment* and journals for practitioners like *Environmental Quality Management*, *Corporate Environmental Strategy* and *Eco Management*. Much of the popular literature data has adopted an authoritarian tone, based on subjective facts that advise managers to consider the impact of environmental issues through broad array of managerial practices. Studies in this literature tend to provide generalization based on environmental management techniques, without substantiating their advice from theoretical insights that can be derived from, or extended to the academic literature in business management. As such, practitioner's literature focuses on the formulation of policies of environmental management and on their efficient implementation by highlighting successful cases of best practice (Fussler and James, 1996; Hart 1997; Romm, 1999; Holme and Watts, 2000). A wide range of practical tools, techniques and tactics for engaging with environmental issues are described and suggested in a vast number of books or professional manuals about corporate environmental management (Piasecki, Fletcher and Mendelson, 1999; Madu, 2000; Lesourd, 2001).

During the Nineties, researchers increasingly attempted to apply theories grounded in their own disciplinary traditions to learn environmental related issues. A field of academic research gradually emerged, comprising scholar's interests in environment related aspects in management that has labeled corporate greening, corporate environmentalism, or sustainable management (Schot and Fisher, 1993; Collins and Starik, 1995; Starik and Rands, 1995; Hoffman and Ehrenfield, 1998; Starik and Marcus, 2000; Sharma, 2002). As discussed in Hoffman (2001) the definition of corporate environmental practices has been greatly contested over the

past four decades and represents a high degree of field-level conflict and change. The dispute is linked with the definition of the role of corporation in modern capitalism societies, a topic that has attracted much attention recent years in connection to economic globalization processes. The opinion of Milton Friedman (1970), claiming that “the social responsibility of the business is to increase its profits”, laid the foundation for a disagreement that is still lively nowadays.

The institutional and cultural context has profoundly changed since Friedman’s point of view was published. At present times, it is widely recognized that managers cannot disconnect business concerns from the institutional legitimacy that surrounds decisions intrinsic to capital acquisition, operational efficiency and market reputation. It is currently evident that institutional definitions of environmental protection have moved out from the realm of socially responsible management or mere regulatory agreement to environmental laws and have the realm of strategic businesses management (Berry and Rondinelli, 1998; Bansal, 2002; Marcus, 2004).

Special issues about environmental management as a field of academic research have been published in conventional management journals like “Academy of Management Review”, [vol. 20(4) 1995] and “Academy of Management Journal” [vol. 43(4) 2000]. In the area of operations management, two special issue committed to environmental management as research topic are available in “International Journal of Operations and Production Management [vol. 20(2) 2000] and “Production and Operations Management [vol. 10(3) 2001]. These special issues have the important role of informing the relevance of environment related issues in traditional management research.

The difficulty of organizing the literature in environmental management is related to the fact that academic disciplines involved in the study of the relationships between the natural environment and (business) organizations are tremendously diversified. The topic of corporate environmentalism or sustainability appears as a highly dynamic research context, yet it does not constitute an established academic

field. Different disciplines or sub-specialties in social sciences (such as economics, sociology, psychology, law and ethics) research corporate environmental issues from a different theoretical outlook, in their own specialty terminology, often asking similar questions about the same phenomenon and offering specific implications in their respective fields. Fragmentation in academic research as a result of the multi-disciplinary areas involved is thus a typical feature of the greening literature (Gladwin, 1993), though the same concern has been recently advanced in management accounting research as well (cf. Covaleski et al., 2003; Merchant et al., 2003).

A similar trend in academic research can be foreseen between the early developments of the literature in Quality Management and the recent developments in the environmental management literature. According to recent reviews, only after just about two decades quality management currently entered a mature phase in terms of having established sound definitional foundation (Cua, McKone and Schoeder, 2001; Sousa, 2001; Sousa and Voss, 2002).

In comparisons with the quality management literature, researchers in environmental management have not yet yielded solid foundations for the field given the analogy that can be drawn between quality and environmental management. Observed parallels between quality management and environmental system examined and discussed by several researchers in operations management (among others Klassen and McLaughlin, 1993; Willig, 1994; Bloemhof-Ruwaard, Beekr, Hordijk and van Wassenhove, 1995; Gupta, 1995; Sarkis and Rashid, 1995; Gupta and Sharma, 1996; Kitazawa and Sarkis, 2000; ReVelle, 2000; Sroufe, Curkovic, Montabon and Melnyk, 2000; Corbett and Pan, 2002). These studies point out that quality management and environmental management managerial philosophies and holistic approaches share the following characteristics (Curkovic and Landeros, 2001):

- 1) They aim to improve a company's final output
- 2) They emphasize long-range planning over short-term considerations
- 3) They involve changing relationships between companies and their employers, suppliers, and customers;

- 4) They strive for a cultural change
- 5) They stress improved information, communication, training and accountability;
- 6) They demand continual improvement

Environmental management systems are viewed as being quality management systems extended and modified to deal with environmental issues. The most appropriate example in this direction is given by the international standard ISO 14001 for environmental management systems. For instance, the “no waste” goal of environmental management closely parallels the quality management goal of “zero defects”. Quality management focuses on waste as it applies to process inefficiencies, whereas environmental management tends to focus on physical outputs such as solid and hazardous waste. Because the two managerial concepts share a similar focus, researchers note that it makes sense to use many of the tools, methods, and practices of quality management in implementing an environmental management system (Klassen and McLaughlin, 1993). Similar to ISO 9000, the ISO 14001 Environmental Management System requirements embody the PDCA (plan-do-check-act-) cycle. In the PDCA cycle, an organization plans a change aimed at improvement (plan), implements the change (do), evaluates the results (check) and finally institutionalizes the change (act). For an organization that is committed to implementing or maintaining a continuous source reduction program, some important elements of ISO 14001 include (Cascio, Woodside and Mitchell, 1996):

- Identifying environmental aspects and impacts through a structured process;
- Establishing objectives and measurable goals;
- Defining roles and responsibilities;
- Enhancing awareness and competency among employees by continuous training;
- Completing corrective actions through structured process; and
- Reviewing EMS by senior management through a structured process.

To meet increased demand for environmental performance information, regulatory agencies, environmental groups, international agencies and corporation themselves have developed more sophisticated inventories of performance measures to capture various elements of environmental performance as element of wider corporate social performance (Ilinitch, Soderstrom and Thomas, 1998; Kolk and Mauser, 2002).

For instance, sustainability indicators have been elaborated at national level and periodic reports are available at country level from the Organization for the Economic Co-operation and Development (OECD, 2004). At the sector level, several initiatives have been taken to streamline the measurement and reporting of environmental measures, particularly in sectors more exposed to environmental risks and public analysis. As an example, the National Academy of Engineering completed a comprehensive analysis of environmental performance metrics currently used by four major US manufacturing industries (chemical, electronics, automotive, and pulp and paper) (NAE, 1999). In the chemical sector, recent recommendations on environmental indicators were issued by the Association of the Dutch Chemical Industry (VNCI, 2001) and by the Institution of Chemical Engineers (Icheme, 2002).

The most common approach in operationalizing environmental performance has been through aggregation of a set of indicators and checklists gathered at facility level. Indicators are selected largely because comparable data are available from public pollutant release and transfer registries (PRTRs). Most databases are available in United States, such as the EPA's Toxic Release Inventory, which applies to a wide range of industries and consists of a panel thousand of facilities reporting annual data since 1987. Similarly, Australia, Canada, Korea the Slovak republic and the European Union also operate PRTRs and publicly disseminate collected data at the facility level. In addition, specialized companies in the financial sector have devised an increased number of sustainability ranking systems. Among them, particularly empirical research carried out in North America, the most diffused are the Investor Responsibility Research Center (IRRC) and the Council for Economic Priorities (CEP). As demonstrated by Ilinitch, Soderstrom Thaconmd as (1998), methodological

inconsistencies among measures and rating inhibit stakeholder's ability to interpret such data and make objective comparisons across time. The available databases also been criticized because the performance indicators they contain are neither customized to nor reflective of the issues faced by the individual company or industry.

More recently, Toffel and Marshal (2004) evaluated several weighting methods used to assess chemical release inventories and provide an up-to-date review of the existing approaches that could be used in empirical research. Among the most recent efforts to favor standardization, two initiatives are noteworthy in terms of potential impact on the business community for (GRI, 2002):

1. The comprehensive approach that they proposed, and
2. The attempt to link measurement and reporting of environmental performance measures into financial accounting standards. The first one refers to the guidelines elaborated by the Global Reporting Initiative.

These guidelines are for voluntary use by organizations for reporting on the economic, environmental, and social dimensions of their activities, products, and services. So far, this initiative appears to be the most diffused approach to report a company's Triple Bottom Line. As to December 2004, 615 organizations voluntarily adhered to the use of GRI guidelines for their corporate reports. The second guideline is more specifically focused on the definition, measurement and disclosures of environmental information drawing directly from International Financial Reporting Standards (UNCTAD/ISAR, 2002).

Historically, social accounting can be considered as the pioneer field of environmental accounting. In a review of social accounting literature, Mathews (1997) noted a number of definitions of the field of social and environmental accounting. He concluded that definitions appear to be problematic because of the debate voluntary or mandatory disclosure, and the quantitative versus qualitative dimensions of information. Similarly, Gray (2002) concurs that social accounting takes a wide variety of forms and appears under various labels (i.e. social

responsibility, social audits, corporate social reporting, employee and employment reporting, and environmental accounting and reporting), that cover all forms of “accounts which go beyond the economic”.

The renewed interest about Social and Environmental Accounting since the early Nineties is associated with the recent outgrowth of initiatives that relate the diffusion of Environmental Management Systems and the debate over corporate social responsibility. Environmental issues have steadily regained relevance in different areas of accounting practice. In recent years, the most remarkable signal of renewal of refers to the diffusion of Corporate Environmental Reporting (KPMG/WIMM, 1999; Gray and Bebbington, 2001; Kolekt et al., 2001; KPMG/UvA, 2002; Price Waterhouse Coopers, 2002; Kolk, 2003, 2004; Price Waterhouse Coopers, 2004b; Trucocs plc Environmental Agency, 2004). Among the latest terms created to address these issues is the, so called, Triple Bottom Line popularized by the consultant John Elkington (1997), as a conceptualization of the need for businesses to deliver simultaneously economic prosperity, environmental quality and social equity (refer to Adams, Frost and Webber, 2004 for a review of the literature about Triple Bottom Line).

From business perspective, interest has steadily grown with the aim of developing a better understanding of environment-related financial costs and benefits as an input to usual (management) accounting practices (Schaltegger and Burritt, 2000; Burrit, Hahn and Schaltegger, 2002 ; Jasch, 2003; Burritt, 2004). As anticipated in the previous topics, this interest triggered emergence of a new field in the mid-Nineties labeled “Environmental Management Accounting” defined by Bennett and James (1998, as: “the generation, analysis and use of financial and related non-financial information in order to integrate corporate environmental and economic policies and build a sustainable business”.

The United States was the first country to establish a formal public program to investigate and promote Environmental Management Accounting in collaboration with the Environmental Protection Agency (US EPA) (EPA, 1995). Moreover, there

has been a recent, strong upswing in interest and activities around Environmental Management Accounting in a number of other countries. Among them, the US EPA program has been taken over in 2002 by an international initiative with the mission of promoting integration of environmental cost information and materials and energy flow information into routine management decision making of private and public sector organizations.

Regarding the contents of the practitioner's literature, Environmental Management Accounting mainly refers to the application in the environmental area of techniques in cost management and cost accounting. For instance, an environmental accounting system can be designed as a specific application of Activity-based costing, which focuses on environmental related activities as key cost drivers. Capital budgeting and valuation techniques have also been adapted to evaluate green investments (Tellus Institute, 1995). Life costing is another area of recent developments, though the emphasis on end-of-life costs reflects the growing importance on product-life costing in management accounting in general (NDCEE, 1999). Thus, it can argue that the same management accounting techniques available for traditional business operations could be adapted to satisfy the generation and use of information for environment related purpose.

In the United States, forty-five case studies documenting the benefits of environmental accounting have been carried out under Environmental Management Accounting Project sponsored by the Environmental Protection Agency (Ditz et al., 1995). Similarly, Epstein (1996) provided insights into current diffusion Environmental Management Accounting in thirty US companies through a survey of practice sponsored by the Institute of Management Accountings. More recently, Frost and Wilmhurst (2000), document the diffusion of Environmental Management Accounting in Australia. A survey of practice carried out Europe under the "Ecomac" project has investigated the implementation of eco-management accounting in eighty-four companies in four European countries (Bartolome et al., 2000). The survey highlighted a moderate but growing interest in Environmental

Management Accounting practices, though with international differences and despite internal barriers to their implementation.

Proponents of a, so-called, “sustainable balanced scorecard” argue about the importance to interpret an environmental strategy into measures of performance that reflect, for illustration, the objective to condense the use of materials, to lower the proportion of waste, or to encourage environmentally gentle process and product design. At this point, no agreement exists on the appropriate set of environmentally induced financial measures and related financial indicators to include in a balanced scorecard (Schaltegger and Burrit, 2000).

As far as academic research is concerned, environmental accounting research has emerged over the last twenty years as a distinctive thread of research within the broader area of social accounting. Scholarly research in environmental accounting appears to be highly fragmented in approaching and studying phenomena that relate to sustainability and environmental management. The variety of research carried out in the field of environmental accounting is clearly reflected in the different research background of the academic journals published in the accounting area. Special issues in academic journals which devoted entire volumes about the state-of-the-art research in the area of social and environmental accounting have been the following: Accounting, Auditing & Accountability Journal [vol. 4(3) 1991, vol. 10 (4) 1997, vol. 15(3) 2002], Accounting Forum [vol. 19(2-3) 1995, vol. 24(1) 2000 and vol. 28(1) 2004], Accounting, Organizations and Society [vol. 17(5) 1992], the Asia-Pacific Journal of Accounting [vol. 4(2) 1997], the journal of Accounting and Public Policy [vol. 16(2) 1997] and the European Accounting Review [vol. 9(1) 2000].

Finally, in recent years there has been a growing interest about environmental accounting practices as emerged from an overview of the popular literature and the large number of technical guidelines in the field. It appears that the flow of these practices is widely occurring through at different tempo in different countries. As with any novel field, however, there is a lack of descriptive and explanatory studies concerning this phenomenon. This is particularly evident the sphere of environmental

management accounting, which was allocated a specific role in the accounting field only a decade ago (Milne, 1996).

This thesis aims to contribute to the mainstream, business case literature in Cost and Management Accounting. Therefore, the further section presents an application as a case study of environmental accounting. The studies belonging to more interpretative or critical perspectives that deal with performance measurement and empirical study criticism will be slightly discussed.

CHAPTER 4

CASE STUDY

4.1. Aim of the Study

The importance of the Environmental Management Accounting has explained in previous chapters. Nevertheless, Environmental Management accounting practices has been noticed tremendous importance from the different literatures. The significant point of this work to discover why, how and with what effects companies implement these practices. Or are they conscious of these applications? Therefore, this thesis aims to examine the role and the implications of Environmental Management Accounting which directly refers to Environmental Cost Management in organization.

There are lots of reasons that can be forwarded to substantiate the choice of this research topic. First one is an argument which related to Environmental Management Accounting as a novel area of research. The second debate related to empirical field of Environmental Management Accounting, which is consisted from authenticity theories and findings. Cost management is identified as a contiguous area to environmental management, from which theoretical dispatches and empirical insights are drawn and adapted to Environmental Management Accounting as an innovative field. Although a further reminded; Environmental Management Accounting provides a challenging empirical setting regarding the evolution of the field of management accounting and control. In their renowned review of the historical evolution of management accounting system, Johnson and Kaplan highlighted many of the deficiencies in the way which management accounting information is used to manage business (Johnson and Kaplan, 1987). While financial information remains the overriding goal, it is considered insufficient to reflect other relevant dimensions of organizational performance (Ittner and Larcker, 1998). Last argumentation is framed over Environmental Management Accounting as a symbolic area at the margins of accountants. The investigation of Environmental Management Accounting as novel research domain allows a broader discussion about the current

evolution of management, accounting, and other sub-concepts field and its potential role in the future.

There are number of factors that motivated researcher to substantiate the choice of this industry for research. First of all researcher had experiences in this industry. Second debate related to developing of poultry industry and increasing number of poultry oriented producing firms in Turkey. Because high demand of poultry products in internal and external markets. Addition to these, to develop healthy and clever generation each person needs to consume 60-70gr animal fat (protein) per day. The easiest and inexpensive way to obtain this demand is egg and chicken meat. Researcher would not exaggerate that this paper will be used as guide in this scope. Hence, users of this work would be able to appraise the theoretical explanations and practical study. In sum, the purpose of this thesis is to explore determinants and effects of Environmental Management.

4.2. Methodology

Using the insights gained from the literature review that presented in Chapter 3 as a conceptual frame of reference, the research is explored by a case study in one of the slaughter house firms among financial and managerial site. The survey method is suitable for the investigation of naturally occurring phenomena when publicly data about the research topic are not available (Brownell, 1995). In addition, this research method ensures experimental application and offers more opportunities for empirical generalization than survey methodology. More details about case study design will be presented in detail in further topic. Referring to the findings of the research, I subsequently explore the important points by using insights from longitudinal case study within a business unit of a Slaughter House's company in the poultry sector.

The case study includes face to face interviews, since it allows uncovering causal patterns regarding how organizational aspects play a role in the integration of environmental management, accounting and cost. Case study methodology has been suggested as a suitable approach for examining organizational phenomena in-depth,

particularly in research areas like management accounting where problems in gaining access to sensitive information in contemporary organizations are recurrent (Bruns and Kaplan, 1987). On this matter, Zimmerman (2001: pgs. 419-420) recognizes the increased relevance of acquiring general data from organizations when he states that:

“...probably the single biggest factor hampering empirical managerial accounting research is the lack of consistent data about what firms do internally”.

In addition, the methodology employed in this chapter contains a longitudinal dimension. Studies with a longitudinal element in their design better allow the detection of causal relationships, the inference of data processes, understanding of organizational change, and the inclusion of contextual constraints (Ahrens and Dent, 1998). Longitudinal case studies have grown in popularity in accounting research in recent years as methods to tease out the cumulative characteristics of organizational change processes in management accounting (Vaivio, 1999). This case study investigates the dynamics of change with respect to the implementation of an Environmental Cost Accounting. It generates insights on the reasons behind the motivation of the case company to shift towards a more refined management and accounting reporting systems for environmental-related information.

Case studies allow researchers to infer casual relationships and to comprehension theoretical patterns in their real settings (Yin, 2003). Hence, case studies serve the purpose of exploring contemporary issues, as well as of developing and expanding theories (Eisenhardt, 1989). The first part of the case analysis provides a deductive approach of explanation that is positivist approach in (management accounting) research (Ryan et al., 2002). The objective is to expand the theoretical framework proposed at the outset of the thesis that reflects the results from the empirical research-based study together with the insight collected during the field observation (reproductive research strategy ‘in Blaikie, 2000).

In sum, by combining a theoretical research, literature review and with a case study covering organizational dynamics of change, this thesis attempts to draw some

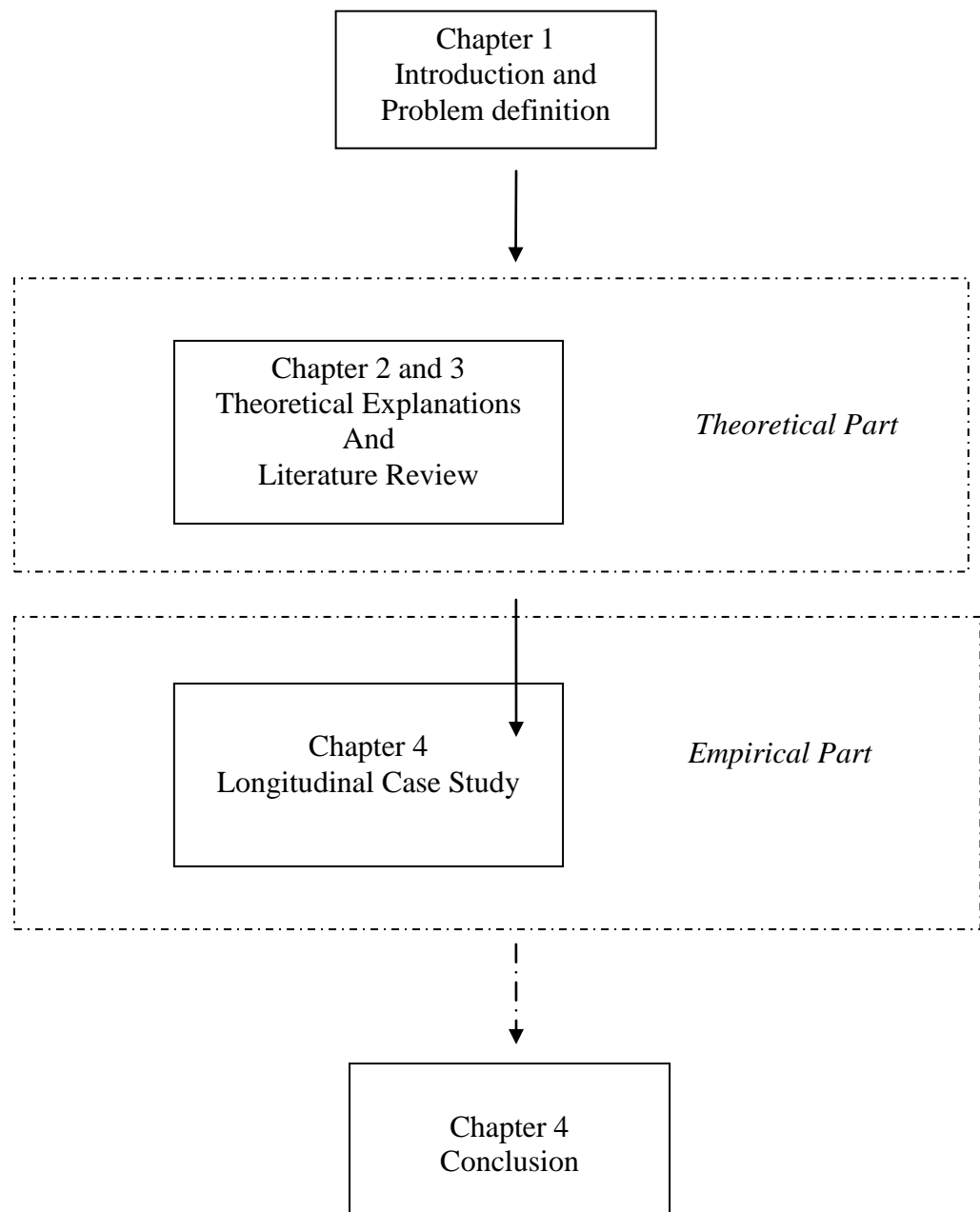
exploratory results about the use and effects environmental measurement accounting which referred to Environmental Cost Management. A case study allows the investigator to concentrate on specific instances in an attempt to identify processes which may be crucial, but which might remain not specified in a large-scale survey. The structure of the thesis is depicted in Figure 9. In Chapter 2, already have been reviewed the literature in environmental management and environmental accounting. From the variety of disciplines in which greening has been studied, the chapter attempts to provide an organized over view about empirical studies that examined determinants and effects of environmental management.

Then, the different pragmatism characterizing academic research on environmental accounting would be described. It is important to point out that specific research agendas have pursued in this area to better position this thesis in prior literature. Researcher tries to specifically motivate the focus on environmental management accounting as object of investigation in this thesis. Also in Chapter 2, determinants and effects of environmental management system are discussed and benefits are developed.

The case was constructed using a variety of evidential sources. These included: semi-structured interviews; documentary like budgeting, manuals, procedures; internal memoranda and presentations concerning the on-going initiatives about environmental accounting; newsletters and publicly available information on the company's mission and activities, particularly in the field of environmental management and sustainability; press releases and media reporting about issues sensitive to the theoretical model.

In order to provide a representation of a mass of complex textual material, I have necessarily simplified aspects of the case organization and distilled the main issues relating to the research objectives of the thesis.

Figure 9. Structure of the thesis.



4.3. Limitations

The case study was developed in partnership with a manufacturing company operates in the poultry industry as the Slaughter House. A detailed disclosure agreement between the company and me was dialed to ensure confidentiality during the execution and reporting of the project. To ensure integrity of the information collection process, management of this firm agreed at the beginning of the project

that the company would review the research output to correct inaccuracies, but would not dictate the substance of neither the analysis nor conclusions of the study. It was also agreed that the company would retain the right to remove or cover up any internal sensitive data or information that would potentially damage the firm's competitive position.

The fascinating point is that the firm concerns about the waste management and investing million dollars to not harm the environment, even so they are not deeply instructed about the Environmental Management Accounting. Another compelling, related to irregular financial records. The firm balancing the appropriate accounts, according to the situation and necessity. The financial statements couldn't be flexible material for the egoistic satisfaction. It is catastrophic phenomena when the Environmental management Accounting applied according the firms rule instead the original contest.

This kind of management is delusion of reality. It complicates the managing the environmental costs. Consequently leads the wrong decisions, what can be tragedy for the future of the firm.

Instead, I opted to use the field of study as an illustrative case, given its prominence to relative strength and limitations of the model. In addition, the longitudinal dimension of the case study allowed a richer analysis and interpretation. In combination, the case method was expected to provide higher explanatory power and richer empirical insights than the survey study.

4.4. Description

Firm which will be interpreted in case study were founded in the 1996. The origin industry of the firm was layer chicken production. Further, company realizes that there is absence of Slaughter House which is adapted to layer slaughtering process. That days investing to such plant needed high capital. Not all layer

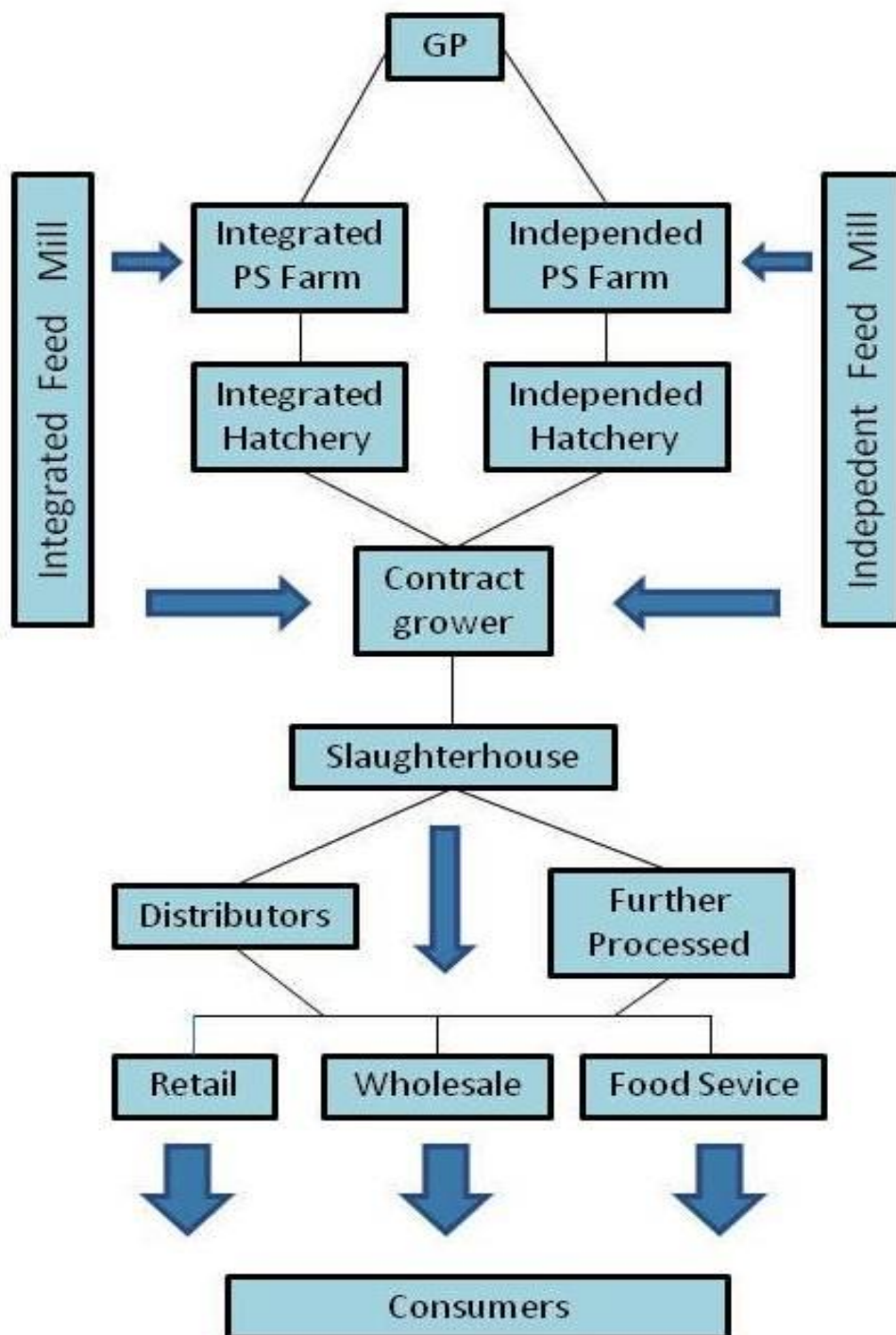
producers could effort such an investment. At first Slaughter House used to slaughter own layer chickens. Later the firm started to serve other layer producers.

Slaughtering, till to the final stage capacity is 4.000 chickens/hour. Daily these capacity ranges between 31.000- 33.000 chickens. There is 90 blue-workers and 20 white-collar workers. Ready products generally exported to African and Far East countries.

This firm accredited by ISO 9001 quality management system, at the same time maintains TSE standards and HACCP 13001 certificate. The product of the firm are appreciated by the final consumer and demand is the leading cause of slaughterhouses, and all critical control points in all phases of the operation staff constantly checks done by the Veterinary and Food Engineers, meticulously ensure compliance with hygiene rules are put into operation next to all the raw materials and packaging materials due to the use of continuous checking. Technological innovations, this business has always followed immediately by applying innovations in an environmentally friendly manufacturing.

One idea is to offer the consumer a quality product in the emerging enterprise that turned into chicken waste rendering plant again brought into the economy, the existing chemical and biological treatment of liquid waste facility has been discharging treated under the supervision of the environmental engineers.

Figure 10. Poultry market and production chain.



4.5. Case Study

As in previous chapter the profile of the case study company have been explained. According to mention mission and vision of the firm concerns not only about the healthy and hygienic products, parallel to that they pay attention to an environmental management as much as possible. Hence further explanation about the operation process and some criticism will highlight the firm which stays within the framework of this mission.

This thesis aims to explain each level of production and processes step by step, to detect the problems (waste products) of this organization and to observe how the company take over this waste's or have they recover these wastes to useful products.

This slaughter house consisted of 4 main plants which are working in closed and continue system. These are Chicken Production Line, Rendering Line, Purification (Recycling) Line and Steam House:

A) Chicken Production Line. (Look at the figure10.)

A.1. Hanging Line

Here the live chickens are hanged manually to suspenders. Suspenders lines moves to the further processes. At this stage, the waste is defunct chickens. This mortality related to stress caused during collecting and transportation. The rates of mortality which are caused by this reasons is %3-4. The dead chickens are collected and dispatched to the rendering pool. Dead livestock not allowed slaughtering process. Because, of religious and cultural cultivations is not allowed. At the same technically it is not available to slaughter the dead chickens. Rendering stage will be highlighted in detail in further theme.

Picture 1. Hanging Line



A.2. Shocking

Line with hanged livestock forwarded to auto-electrical shocking machine. Chickens paralyzed with electricity at 24 Volt. It makes slaughter easier and faster. Then a palsy chickens forwarded to slaughter.

A.3. Slaughtering

In this factory slaughtering is made manually. Here the important point of this stage to properly pour the blood. Otherwise if the blood residues causes livid spoil on the chicken body. And will cause an unpleasant image on the product.

The dangerous waste, the blood occurred. As known blood is the main nutrition source for different types of microorganisms as a viruses, bacteria's etc. To prevent this threat and to stay in an eco-friendly environment, blood consistent directed to purification unite by pressure drain channels. Purification stage will be highlighted in the further topic.

Picture 2. Slaughtering



A.4. Feather Softening

In order to make plucking more easily chicken follows through the closed hot water steam tunnel what makes feather softened. Hence, the occurred wastes are spoiled water and a few numbers of feathers. This waste mixture forwarded to rendering pool.

A.5. Plucking

In this stage the chicken dispatched through a closed steam system. Again, the occurred waste is spoiled water and feathers. Also as a previous stage this mixture forwarded to rendering pool.

A.6. Comb Slaughtering

Chicken combs are slaughtered. Hence, according to the Turkish conditions the waste is comb. But the interesting solution what makes the waste as a source of income; after collecting and packing combs, are exported to Far East countries as a food product. Thus, input of foreign money provided to an organization.

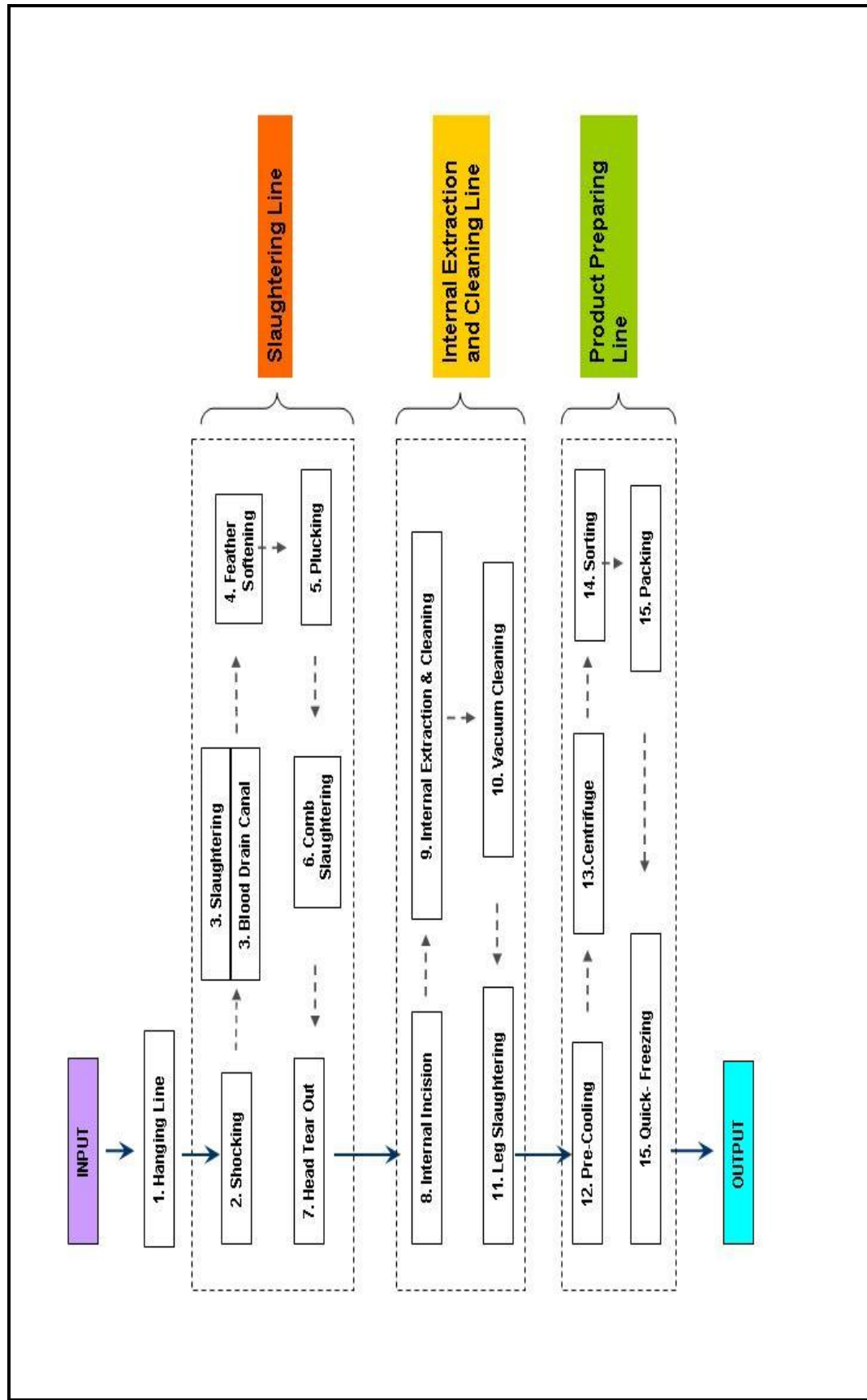
Picture 3. Plucking



Picture 4. Comb Slaughtering



Figure 11. Chicken-Slaughter production line



A.7. Head Tear Out

As a title briefly gives some explanation, this stage is involved with tearing out the head from chicken body. This operation made automatically by machine. As a result obtained waste is chicken heads. These wastes are forwarded to a rendering pool for further process.

Picture 5. Head Tear Out



A.8. Internal Incision

Chests are being cut for the next stage, to facilitate the internal organs extraction process.

A.9. Internal Extraction and Cleaning

Internal organs extracted and cleaned manually by the stuff. Thus, as result the inner organs waste delicately forwarded to rendering pool.

A.10. Vacuum Cleaning

The inner lungs are cleaned with vacuum suction pistols. Lungs, waste products are again depicted to rendering pool. Normally most of Slaughter House firms assesses the lungs as output product and provide an income source.

Picture 6. Internal Extraction and Cleaning



Picture 7. Vacuum Cleaning



A.11. Leg Slaughtering

Chicken legs are slaughtered and assessed as another output product. As in previous stage was explained about the comb, the similar position is acceptable to the chickens' legs. This product is exported to Far East countries.

A.12. Pre-cooling Stage

Normally, the chicken body temperature is 42 degrees. Also, more held procedures mentioned above increases the temperature. Pre-cooling operation substantiated in a cold water channel. Where paced rotating helix mechanism. Decreasing temperature is a significant operation due to facilitate future operations. Hence, the obtained waste is spoiled water. This waste product transferred to purifying unit.

Picture 8. Pre-cooling stage- Chiller.



A.13. Centrifuge

A centrifuge is a piece of equipment, generally driven by an electric motor that puts an object in rotation around a fixed axis, applying a force perpendicular to the axis. The centrifuge works using the sedimentation

principle, where the centripetal acceleration causes more dense substances to separate out along the radial direction. The aim here is to remove excess water. Hence, waste product (spoiled water) transferred to purifying unit.

Picture 9. Centrifuge



A.14. Sorting and Packaging

The ready product (Chicken) sorted according to weight and later packed to stock in quick-freeze refrigerators.

Picture 10. Sorting and Packaging



A.15. Quick-Freezing

The aim of this operation is to shock or quick-freeze the product what makes stocking and transportation period longer and to prevent the product from spoilage. This are closed big ammoniac based refrigerator systems warehouses where the temperature is -40°C .

The significant point is to dispose or recycle occurred product waste without harming the environment. That's why this firm is concerned and made investments to establish green production line. Herein, firm has Rendering and Purifying unites. Where wastes are recycled and purified to a more useful type.

B) Rendering Line

Rendering unite consisted from Rendering Pool, Deodorizer Unite and Caldron Preparing (Cooking Boiler). First of all, waste (dead chicken, head, feather, spoiled water and inner organs) are collect in rendering pool and parallel to this stage, deodorizer eliminates unpleasant odors. At the same time rendering pool splits water and wastes from each other. The consumption of water in this Slaughter House is 600-700tn/day. To avoid extra usage of water the % 20 (120-140tn) of this amount recycled and redirecting to chicken production line. Than, remaining waste mixture pumped to the caldron. Rotating helix mechanism inside the caldron fasts the cooking process and blends the mixture. As a result the secondary product output is granulated nutrition additive for live stock. The high consistent of protein makes it demanded product in the market. Quantifying by numbers the next data observe the further information: one live chicken weight 1,40kg. The obtained wastes during operations are %36 (0,504kg). Hence, %30 (0,151kg) of this waste ($0,504\text{kg} \times 0.30 = 0.151\text{kg}$) converted to utilizable product. The cost of this additive is 0.09TL/kg. According to differentiating slaughtering capacity, provided income differs between 6.500-7.400TL/mnth. At the same time the income obtained from combs and foot figures a serious number. Now days, chicken-combs/foot cost is 250 USD/ton. The structure of the derived secondary products is shown in figure 12.

Table 10. Slaughter House Sub-Products (Byproducts) Income Rates

Water Consumption	600-700 tons/day
Recycled & Reused Water	(% 20) 120-140 tons/day
Live Weight (Layer)	1,40 kg/Layer
Occurred Waste %	(% 36) 0,504 kg
Utilized Waste to Additive (Sub-product)	(% 30 Of % 36) 0,151 kg
Market Price of Additive (Sub-product)	0,09 TL/kg
Market Price of Comb & Foot	250 USD/Ton
Obtained Income from Additive	6.500-7.000 TL/mnth
Sub-products Incomes meets expenses of factory overhead cost%	% 45-50

C) Purification Line

Purification is the process of removing undesirable chemicals, materials, and biological contaminants from contaminated water. The goal is to produce water fit for a specific purpose. Most water is purified for human consumption (drinking water) but water purification may also be designed for a variety of other purposes, including meeting the requirements of medical, pharmacology, chemical and industrial applications. In general the methods used include physical processes such as filtration and sedimentation, biological processes such as slow sand filters or activated sludge, chemical processes such as flocculation and chlorination and the use of electromagnetic radiation such as ultraviolet light. The purification process of water may reduce the concentration of particulate matter including suspended particles, parasites, bacteria, algae, viruses, fungi; and a range of dissolved and

particulate material derived from the surfaces that water may have made contact with after falling as rain.

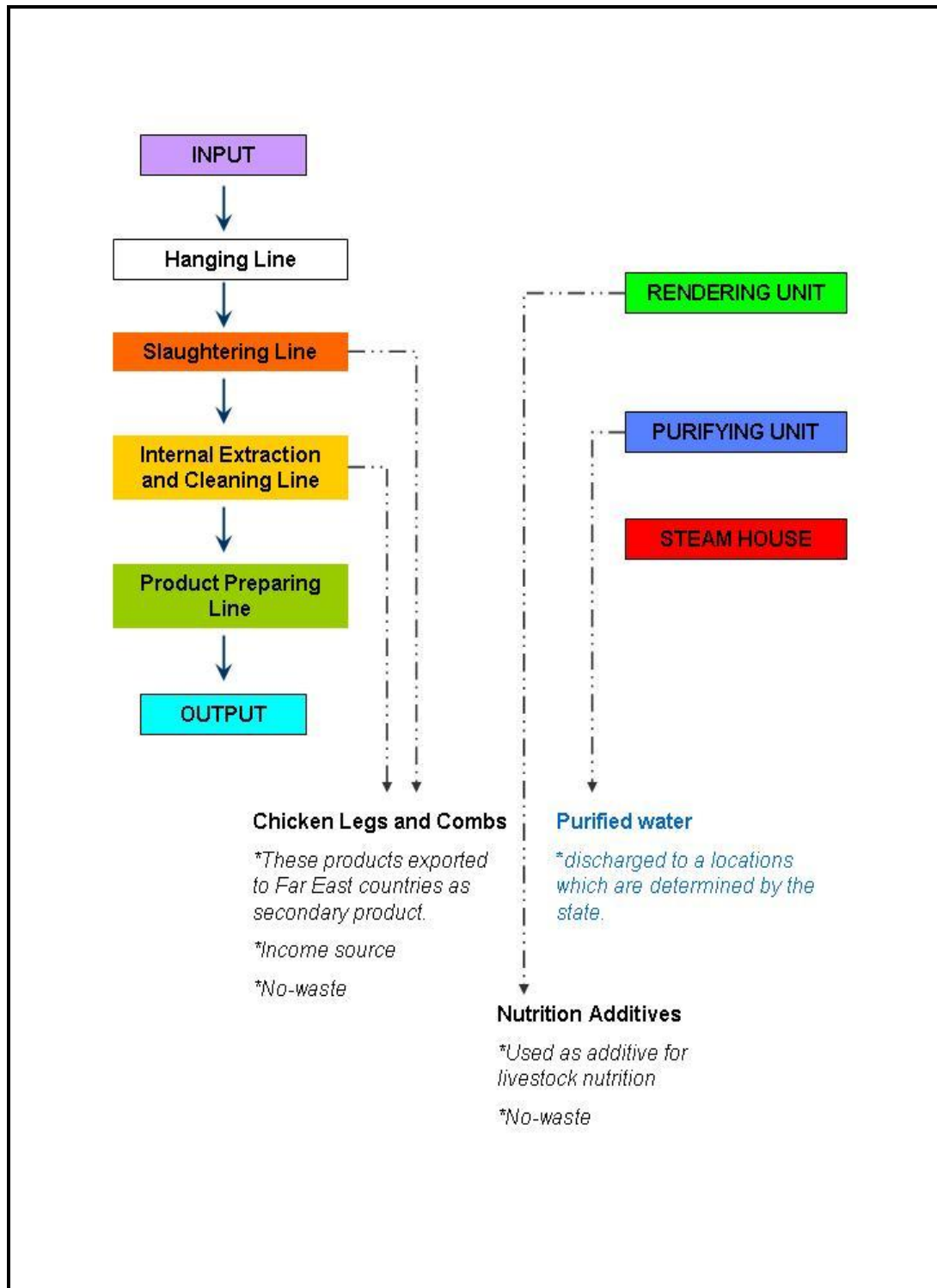
The standards for discharging water quality are typically set by governments or by international standards. These standards will typically set minimum and maximum concentrations of contaminants for the use that is to be made of the water.

Selected firm in this case study research consisted from further purification system:

- 1) First of all, blood and spoiled water collected in the pool. Than pumping and containment, the majority of water must be pumped from its source or directed into pipes or holding tanks. The structure of the waste circulation shown in figure 13. To avoid adding contaminants to the water, this physical infrastructure made from appropriate materials and constructed so that accidental contamination does not occur.
- 2) Purification of surface water is to remove large debris such as sticks, leaves, trash and other large particles which may interfere with subsequent purification steps.
- 3) Chemical process is applied as next step of degrading purification. Flocculation is a process which clarifies the water. Clarifying means removing any turbidity or color so that the water is clear and colorless. Clarification is done by causing a precipitate to form in the water which can be removed using simple physical methods. Initially the precipitate forms as very small particles but as the water is gently stirred, these particles stick together to form bigger particles. Many of the small particles that were originally present in the raw water adsorb onto the surface of these small precipitate particles and so get incorporated into the larger particles that coagulation produces. In this way the coagulated precipitate takes most of the suspended matter out of the water and is then filtered off, generally by passing the mixture through a coarse sand filter or sometimes through a mixture of sand and granulated anthracite (high

carbon and low volatiles coal). Coagulants / flocculating agents that may be used include:

Figure 12. Secondary output products (Byproducts) which are derived from the production stages.

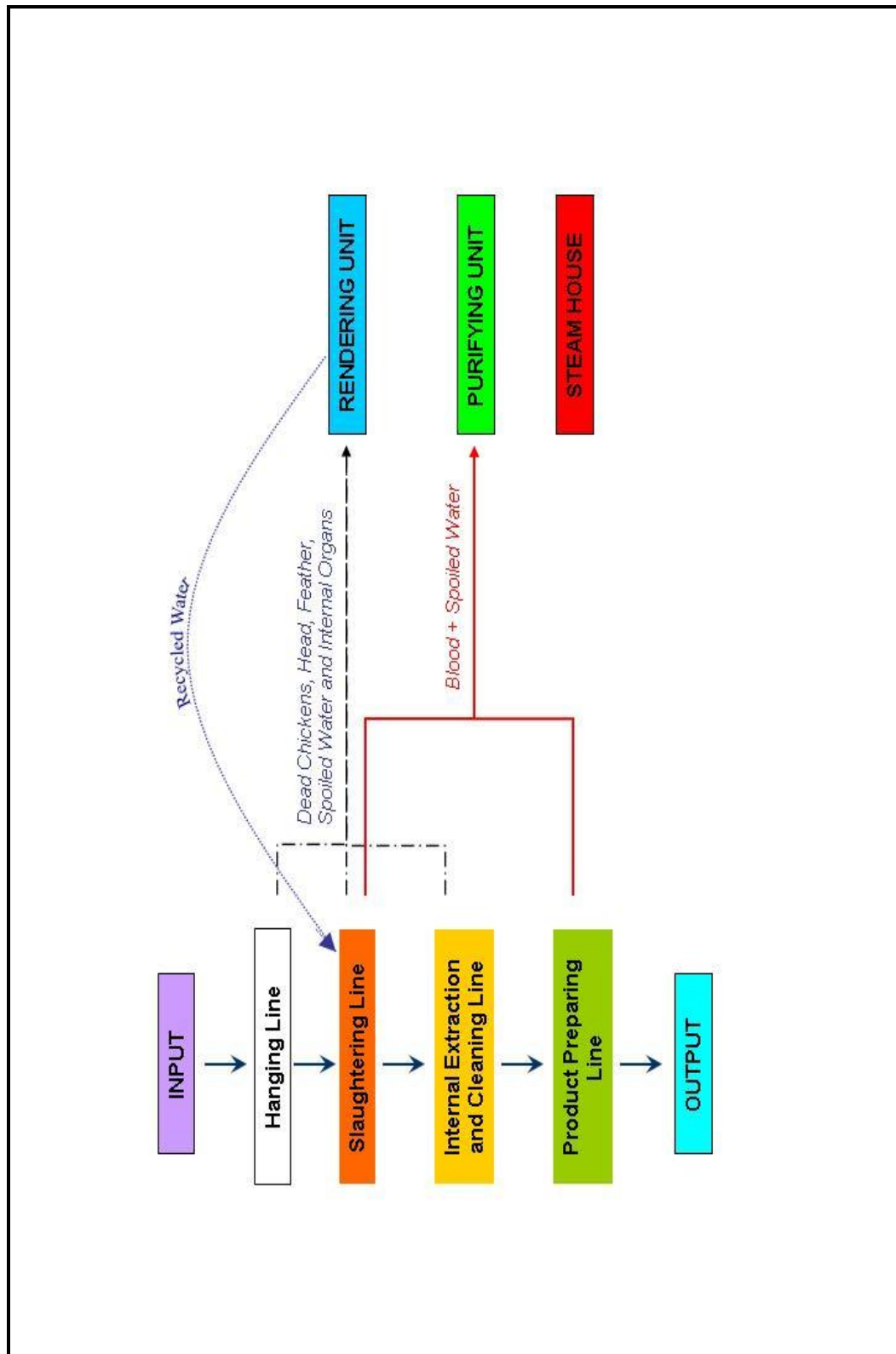


- a. Iron (III) hydroxide. This is formed by adding a solution of an iron (III) compound such as iron (III) chloride to pre-treated water with a pH of 7 or greater. Iron (III) hydroxide is extremely insoluble and forms even at a pH as low as 7. Aluminum hydroxide is also widely used as the flocculating.
 - b. PolyDADMAC is an artificially produced polymer and is one of a class of synthetic polymers that are now widely used. These polymers have a high molecular weight and form very stable and readily removed flocks.
- 4) After chemical degradation minimized waste liquid depicted in biological pool for biological purification process. Activated sludge is a process for treating obtained waste liquid using air and a biological flock composed of bacteria and protozoans. The process involves air or oxygen being introduced into a mixture of primary treated industrial liquid waste mixture combined with organisms to develop a biological flock which reduces the organic content of the sewage. This material, which in healthy sludge is a brown flock, is largely composed of saprotrophic bacteria but also has an important protozoan flora mainly composed of amoebae, Spirotrichs, Peritrichs including Vorticellids and a range of other filter feeding species. Other important constituents include motile and sedentary Rotifers. In poorly managed activated sludge, a range of mucilaginous filamentous bacteria can develop including Sphaerotilus natans which produces a sludge that is difficult to settle and can result in the sludge blanket decanting over the weirs in the settlement tank to severely contaminate the final effluent quality. The combination of wastewater and biological mass is commonly known as mixed liquor. Surplus activated sludge (S.A.S.) or waste activated sludge (W.A.S). S.A.S is removed from the treatment process to keep the ratio of biomass to food supplied in the wastewater in balance. S.A.S is stored in sludge tanks and is further treated by digestion, either under anaerobic or aerobic conditions prior to disposal.

This sewage treatment plant uses axial flow pumps to transfer nitrified mixed liquor from the aeration zone to the anoxic zone for denitrification. These pumps are often referred to as internal mixed Liquor recycle pumps (IMLR pumps). The raw sewage and the nitrified mixed liquor are mixed by submersible mixers in the anoxic zones in order to achieve denitrification. Activated sludge is also the name given to the active biological material produced by activated sludge plants.

- 5) After separating most flock, the water is filtered as the final step to remove remaining suspended particles and unsettled flock.
- 6) Distilled water has a pH of 7 (neither alkaline nor acidic) and sea water has an average pH of 8.3 (slightly alkaline). If the water is acidic (lower than 7), lime, soda ash, or sodium hydroxide is added to raise the pH. For somewhat acidic waters (lower than 6.5), forced draft degasifiers are the cheapest way to raise the pH, as the process raises the pH by stripping dissolved carbon dioxide (carbonic acid) from the water. Lime is commonly used for pH adjustment for municipal water, or at the start of a treatment plant for process water, as it is cheap, but it also increases the ionic load by raising the water hardness. Making the water slightly alkaline ensures that coagulation and flocculation processes work effectively and also helps to minimize the risk of lead being dissolved from lead pipes and lead solder in pipe fittings. Acid (HCl or H₂SO₄) may be added to alkaline waters in some circumstances to lower the pH. Having alkaline water does not necessarily mean that lead or copper from the plumbing system will not be dissolved into the water but as a generality, water with a pH above 7 is much less likely to dissolve heavy metals than water with a pH below 7.

Figure 13. Waste assessment, circulation scheme.



- 7) Pre-chlorination – incoming recycled water is chlorinated to minimize the growth of fouling organisms and to resolve distasteful smell.
- 8) Degradation and arranging to acceptable ranges of concentrations of contaminants, recycled water discharged to areas which are determined by “İZÇEVRE”. Other effecting decision, investment is installing tube infrastructure from slaughter house till to discharge area. This infrastructure length is 3,4 km. Hence, avoids usage of vacuum trucks. Thus application is eco-effective and long-term solution. There is no need to supply vacuum truck, and accommodate with petroleum. As a result no CO₂ emissions and no petroleum expenditures. It is another significant point concerning of green production.

4.6. FINDINGS and CONCLUSION

The first considerable thing should be mentioned is know-how investment. Project of this firm related to utilize the activated sludge without further process and discharging. In other words activated sludge used as a raw material to preparing new and usable products. The project is still under developing and research stage. But, a first experiment shows that by processing the step of different chemical reactions, active sludge could be converted to a lap which used as dog and cat food. That means even acceptable range of degrade waste not drain out to environment. This project needs very serious capital of investment. Even though it looks that the management certainly does not exceed the investment decision to give up. Despite the un-grammar financial records this decision is appreciable not only for the firm but for all humanity in this world.

Observing from financial prospective sub-product incomes are reduced from overhead cost. These incomes meets %50-60 of overhead costs. Unfortunately, there were no expert answer to a question does this method is right implementation. Normally, the costs are the factor which determines the sales price. Consequently, these incomes decreases the overhead costs parallel to that general cost are being decreased too, and increases the competitiveness of the company. At first view, there seems no irrationality. But uncertain bookkeeping records causes uncertainty in financial statements. Moreover, this method is contrary to the system of Environmental Management Accounting.

“İZÇEVRE” is a governmental organization which controls the purified water quality. Once a week “İZÇEVRE” responsible incumbents takes examples to analyze in laboratory. Results are recorded to the organization archive. If the concentrations of contaminants are not at the acceptable ranges organization punished for this penalty. Luckily, this company continued existence of an environmentally friendly policy, haven’t been punished since 2002. But, here rises a question about the penalties; How firm manage such penalties in financial statements? Interestingly, the answer for this question was not difficult to get. Penalties were added to overhead

cost. Does this application is right? This question is argumentative and needs to be criticized, because as were lanced that is unfavorable method according to Environmental Management Accounting.

Another view was taken from annual expenditures (table 10) of the firm used as a research in this thesis, that there is no item that related to the environmental expense. Such accounting records look like foggy weather conditions. Emphasized point that firm able to see only the anterior short distance. There is no guarantee that something dangerous not come outs in front of. As mentioned before the incomes obtained from the secondary output products are reduced from overhead cost. Actually it would be better to record such incomes under the new account item. Also the same application is valid for the environmental related expenditures. This kind of application makes records, easier to detect the statistical changes as ups and downs in different periods. Therefore, it makes easier recognition of unexpected expenditures. In addition, according to background of these records it helps to predict the future complexion. Holding subject to this approach, it can become one of the most important tools used to measure the overall performance of the company.

Table 11. Annual expenditures of Slaughter House firm which used in case study research.

Items	% Cost
Utilities	10.58
Maintenance and repair	4.61
Labor direct	15.36
Factory overheads	10.24
Administration Costs	5.12
Total Operating Costs	45.92
Depreciation	34.11
Cost of Finance	19.98
Total Cost	100

A significant mistake of this firm depends on wrong investment. In other words according investigation the Caldron was not suitable for chicken waste. Actually this Caldron machine designed for preparing fish powder. So the input material is fish compounds. Structure of the chicken waste degraded more difficult than fish one. That's why, the period of preparing additive longer than normal. Therefore the consumption of energy is higher. As a result expenditure is increased.

Even though the firm has modern technology, but have inaccurate accounting system. Theoretically the firm applying both *Life-cycle costing* and *Activity-based costing*. Both of these innovative cost control techniques. These techniques aim to prevent from corruptive events. Here, the significant point is to determine the right technique application which gives sustainable results. Depending to these arguments, the given wrong investment decision influences the company's revenue negatively. The unsuitable caldrons are being used in rendering stage to produce livestock nutrition additive. The fatalities of this wrong investment can be interpreted in three points:

- The consumption of the energy is higher than appropriate caldron. The exaggerated cost of energy is hidden under overhead costs. The interesting point the responsible persons are not aware of this hidden cost or paying no attention to this problem.
- Technically these caldrons are not suitable for duration of preparing. The time exposed under the unsuitable temperature and pressure is very danger. There is a high risk of explosion and release of contaminants. This accidental situation causes high rates of Contingent Cost.
- Previously were criticized that there is inaccurate accounting records. As in all industrial plants there are inputs and outputs. Looking from financial statement view these inputs and outputs should be reasonable and stable. Unfortunately, this firm depreciated from overhead cost. Another coincided finding of very high importance is occurrences of

hidden incomes. As result the firm couldn't see the statistical sales data about sub-product.

Outcome of this case proofs that the firm accountancy doesn't have the fundamental Cost Allocation System. To clarify the situation, as conclusion of this thesis, aims to highlight the Cost Allocations (Joint Products and Byproducts). Briefly, a key principle is that all general costs must be allocated to all type of products. Here the learning objective is to identify the splitoff point in a joint-cost allocation. In other words, to identify the point at which two or more products become separately identifiable.

Joint Costs are the costs of a production process that yields multiple products simultaneously. Consider the chicken slaughtering, which yields wings, drumstick and other products. The costs of this process are joint cost. The splitoff point is the juncture in a join production process when two or more products become separately identifiable (Charle, Srikat, G. Foster, Horngren, Rajan, Ittner, 2009).

Separable Costs are all costs related to manufacturing, marketing, distribution and etc. incurred beyond the split off point that are assignable to each of the specific products identified at the splitoff point. At or beyond the splitoff point, decisions relating to the sales or further processing of each identifiable product can be made independently of decision about the other products (Charle, Srikat, G. Foster, Horngren, Rajan, Ittner, 2009).

The outputs of a joint production process can be classified into two general categories outputs with a positive sales value and outputs with a zero sales value. Some outputs of a joint production process have "negative" revenue when their disposal costs (such as the cost of handling non-salable toxic substances that require disposal procedures) are considered. These disposal costs should be added to the joint production costs that are allocated to joint or main products.

When a joint production process yields one product with a high total sales value, compared with total sales value of other products of the process, those products is called a **Main Product**. When joint production process yields two or more products with high total sales value compared with the total sales values of other products, if any, those products are called **Joint Products**. The products of a joint process that have low total sales values compared with total sales value of the main product or of joint products are called **Byproducts** (Charle, Srikanth, G. Foster, Horngren, Rajan, Ittner, 2009).

Joint costs allocation is a bit outside the scope of the subject, but there is a benefit to address this issue to this thesis. Some of the context that requires joint costs to be allocated to individual products or services are (Charle, Srikanth, G. Foster, Horngren, Rajan, Ittner, 2009):

- Computation of inventoriable costs and cost of goods sold for financial accounting purpose and reports for income tax authorities.
- Computation of inventoriable costs and cost of goods for internal reporting purpose (Such reports are used in division-profitability analysis, and they affect evaluation of division managers' performance.)
- Cost reimbursement for companies that have a few, but not all, of their products or services reimbursed under cost-plus contracts with, say, a government agency.
- Insurance-settlement computations for damage claims made on the basis of cost information of jointly produced products.
- Rate regulation for one or more of the jointly produced products or services that are subject to price regulation
- Litigations in which costs of joint produced are key inputs.

The joint costs used in making pricing decisions for joint product shouldn't be allocated to the joint products. Because there is no cause-and-effect relationship that identifies the resources demanded by each joint product that can then be used as a basis for pricing. Today in much of joint-costing, selling prices (though their effects

on benefits received) drive joint-cost allocations. Cost allocations do not drive pricing (Charle, Srikat, G. Foster, Horngren, Rajan, Ittner, 2009).

Joint production process may yield not only joint products and main products but also byproducts. Although by products have low total sales values compared with total sales value of joint or main products. According to P.D. Marshal and R.F. Dombrowski (“A Small Business Review of Accounting for Primary Products, Byproducts and Scrap”) presented two byproduct accounting methods:

1. The production method and
2. The sales method.

The production method recognizes byproducts in the financial statements at the time production is completed. The sales method delays recognition of byproducts until the time of sale. Revenues of byproduct are reported as a revenue item in the income statement at the time of sale. These revenues are either grouped with other sales, included as other income, or are deducted from cost of goods (Charle, Srikat, G. Foster, Horngren, Rajan, Ittner, 2009).

Which method should a company use to get sustainable results? The production method is conceptually correct in that it is consistent with the matching principle. This method recognizes byproduct inventory in the accounting period in which it is produced and simultaneously reduces the cost of manufacturing the main or join products, thereby better matching the revenues and expenses from selling the main product. However, the sales method is simpler and is often used in practice, primarily on the grounds that the money amounts of byproducts are immaterial. Then again, the sales method permits managers to manage reported earnings by timing when they sell products. Managers may store byproducts for several periods and give revenues and income a small boost by selling byproducts accumulated over several periods when revenues and profits from the main product or joint products are low.

After long explanation of different issues of different researchers and problem defining and despite acquiring tested preposition to these calamitous situation it would be better to end this thesis with a golden words, with a poem of Mr. Aldo LEOPOLD, who do not deeply know theme of these thesis but involved as much other researchers which play an important role in destiny of our planet. May be this thesis will be small step to encourage environment. But this poem has much bigger sense which contains all meaning of this thesis...

*"We abuse land because we regard it
as a commodity belonging to us.
When we see land as a community to which
we belong, we may begin to use it
with love and respect."*

Aldo Leopold
A SAND COUNTY ALMANAC

Adams C., W. Webber and Froser G. (2004), Triple Bottom Line: a review of the literature, in: *The triple Bottom Line: does it all add up?* Edited by A. Henriques and J. Richardson, London, Earth Scan, 17-33.

Ahrens T. and J.F. Dent (1998), Accounting and organizations: realizing the richness of field research. *Journal of Management Accounting Research*, 1-39.

Bansal P. (2002), *The corporate challenges of sustainable development*. Academy of Management Executive, 16(2), 122-131.

Bartolomeo M., M. Bennet, J.J. Bouma, P. Heydekamp, P. James and T. Wolters (2002), *Environmental management accounting in Europe: current practice and future potential*. European Accounting Review, 9(1), 31-32.

Bennet M.A. and P. James (1998), *The green bottom line. Environmental accounting for management: Current practice and future trends*. Sheffield, Greenleaf Publishing.

Berry M.A. and D.A. Rondinelli (1998), *Proactive corporate environment management: a new industrial revolution*. Academy of Management Executive, 12(2), 38-50.

Blaikie N., (2000), *Designing social research*. Cambridge, Polity.

Bloemhof-Ruwaard J., P.v. Beek, L. Hirdjik and L.N. Van Wassenhove (1995), Interactions between operational research and environmental management. *European Journal of Operational Research*.

Brownell P. (1995), *Research methods in management accounting*. Melbourne, Coopers and Lybrand, Accounting Research Methodology, Monograph No. 2.

Bruns W.J. and R.S. Kaplan (1987), *Accounting and Management. Field Study Perspectives*. Boston, MA, Harvard Business School Press.

Cascio J., G. Woodside and P. Mitchell (1996), *ISO 1400 guide: the new environmental management standards*. New York, Irwin McGraw-Hill.

Charle T.H., T. Horngren, Srikanth M. Datar, George Foster, Madhav Rajan, Christopher Ittner (2009), *Cost Accounting; A managerial emphasis*, 13th Edition Research Education, New Jersey.

Collins D. and M. Starik, Eds. (1995), *Research in corporate social policy and performance. Sustaining the natural environment: empirical studies on the interface between nature and organizations*. Greenwich, CT, JAI Press.

Corbett C.J. and J.N. Pan (2002), Evaluating environmental performance using statistical process control technique. *European Journal of Operational Research*, 139, 68-83.

Covalesski M., J.H. Evans, J. Luft and M.D. Shields (2003). Budgeting research: three theoretical perspective and criteria for selective integration. *Journal of Management accounting Research*, 15, 3-49.

Cua K.O., K.E. McKone and R.G. Schroeder (2001), Relationships between implementation of TQM, JIT and TPM and manufacturing performance. *Journal of Operations Management*, 19, 675-694,

Curkovic S. and R. Labderos (2001), An environmental Baldrige?. *Mid-American Journal of Business*, 15(2), 63-75.

Ditz D., J. Ranganathan and R.D. Banks (1995), *Green ledgers: case studies in corporate environmental accounting*. Washington DC., World Resource Institute.

Dmitroff-Regatschnig H., Jasch Ch., Schintzer H. (1997), *Entwicklung eines methodischen Ansatzes zur Ableitung von Umweltkosten aus dem betrieblichen Rechnungswesen*, Studie im Auftrag des Bundesministeriums für Umwelt, Jugend und Familie, Schriftenreihe, 24/97 des IÖW, Wien.

Eccles R.G., R.H. Hertz, E.M. Keegan and D.M.H. Phillips (2001), *The Value Reporting revolution. Moving beyond the earnings game*. New York, Wiley.

Eisenhardt K.M. (1989), *Building Theories from case study research*. Academy of Management Review, 14(4), 532-550.

Elkington J. (1997), *Cannibals with forks: The triple Bottom Line of 21st century business*. London, New Society Publisher.

Elkington J. (1998), *Cannibal with Forks: The Triple Bottom Line of 21st Century Business*, New Society.

Epstein M.J. (1996), *Measuring corporate environmental performance: best practices for costing and managing an effective environmental strategy*. Chicago, Irwin.

Epstein M.J. and b. Birchard (1999), *Counting what counts. Turning corporate accountability to competitive advantage*. Perseus Books.

Esra A. (2007), *Enhancing Supply Chain Performance by Integrating Environmental Cost Information and Activity Based Costing*. Dokuz Eylül University. Izmir, TURKEY

EUROSIF (2003), *Socially Responsible Investment among European institutional investors*. Paris, European Sustainable and Responsible Investment Forum.

Frost G.R. And T.D. Wilmhurst (2000), *The adoption of environmental-related management accounting: an analysis of corporate environmental sensitivity*. Accounting Forum, 24(4), 344-365.

Fussler C. and P. James (1996), *Driving eco-innovation: a breakthrough discipline for innovation and sustainability*. London, Pitman Publishing.

German Federal Environmental Protection/ Federal Environment Agency (2003), *Guide to Corporate Environmental Cost Management*. Berlin.

Gladwin T. (1993), the meaning of greening: a plea for organization theory, in: *Environmental strategies for industry: International perspective on research needs and policy implications*. Washington DC.,

Gladwin T., J.J. Kenelly and T. Krause (1995). *Shifting paradigms for sustainable development: implications for management theory and research*. Academy of Management Review.

Graham H. (2008), *Beyond Accounting - Assessing the Impact of Sustainability Reporting on Tomorrow's Business*. The School of Business at the University of Adelaide, Australia.

Gray R. (2002), *The social accounting project and Accounting, Organizations and Society*. Privileging engagement, imaginings, new accountings and pragmatism over critique? Accounting, organizations and Society.

Gray R. and J. Bebbington (2001), *Accounting for the environment*, London, Sage Publications.

GRI (2002), *2002 Sustainability Reporting Guidelines*. Boston, Global Reporting Initiative.

Gupta M.C. (1995), Environmental management and its impact on the operations function. *International Journal of Operations and Production Management*, 15(8), 34-51.

Gupta M.C. and K. Sharma (1996), Environmental operations management: an opportunity for improvement. *Production and Inventory Management Journal*, 37(3), 40-46.

Hart S. (1995), A natural-resource-based view of the firm. *Academy of Management Review*, 20(4), 984-1014.

Hart S. (1997), *Strategies for a sustainable world*. Harvard Business Review, Pgs. 66-76.

Hoffman A.J. and J.R. Ehrenfield (1998), *Corporate environmentalism, sustainability and management studies, in: Sustainability strategies for industry*. The future of corporate practice. Washington DC.

Holme R. and P. Watts (2000), *Corporate Social Responsibility: making good business sense*. Geneva, World Business Council for Sustainable Development.

Icheme (2002), *The sustainability metrics*. London, Institution of Chemical Engineers.

IIRC (2003), *Corporate governance and climate change: making the connection*. Washington DC, Investors Responsibility Research Center.

Iliescu A.Y., N.S. Soderstrom and T.E. Thomas (1998), *Measuring corporate environmental performance*. Journal of Accounting and Public Policy, 17, 383-408.

Institute of Chartered Accountants in England and Wales (ICAEW) (2004), Information for Better Markets, *Sustainability: the Role of Accountants*.

International Federation of Accountants (IFAC) (2005). International Guidance Document: *Environmental Management Accounting*. New York, USA.

Ittner C.D. and D.F. Larcker (1998). Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research*, 36, 1-35.

Jasch C. (2003), The use of Environmental Management Accounting (EMA) for identifying environmental costs. *Journal of Cleaner Production*, 11, 667-676.

Jasch C. and H. Schitzer (2002), *Umweltrechnungswesen -Wir, zeigen, wie sich Umweltschutz rechnet, Beispielsammlung zur Umweltkostenrechnung und Investitionserchung*, Vienna.

Jonsson S. and R.S. Kaplan (1987), *Relevance lost: the rise and fall of management accounting accounting*. Boston, MA, Harvard Business School Press.

King A. and M. Lenox (2000), Industry self-regulation without sanctions: The chemical industry's Responsible Care program. *Academy of Management Journal*, 43(4), 698-716.

Kitazawa S. and J. Sarkis (2000), The relationship between ISO 14001 and continuous source reduction programs. *International Journal of Operations and Production Management*, 20(2), 225-248.

Klassen R.D. (2000), Exploring the linkage between investment in manufacturing and environmental technologies. *International Journal of Operations and Production Management*, 20(2), 127-147.

Klassen R.D. and C.P. McLaughlin (1993), *TQM and environmental excellence in manufacturing*. Industrial Management and Data Systems, 93(6), 14-22.

Kolk A. (2000), *The economies of environmental management*. Harlow, Financial Times Prentice Hall.

Kolk A. (2003), *Trends in sustainability reporting by Fortune Global 250*. Business Strategy and the Environment, 12(5), 279-291.

Kolk A. (2004), A decade of sustainability reporting: developments and significance. *International Journal of Environmental and Sustainable Development*, 3(1), 51-64.

Kolk A. and A. Mauser (2002), *The evolution of environmental management: from stage models to performance evaluation*. Business Strategy and the Environment, 11(1), 14-31.

KPMG/UvA (1999), *KPMG International survey of environmental reporting 1999*. The Hague, KPMG Global Sustainability Services.

KPMG/UvA (2002), *KPMG International survey of Corporate Sustainability Reporting 2002*. De Meern, KPMG Global Sustainability Services.

Kyoto Protocol

<http://europa.eu.int/comm/environment/climat/kyoto.htm>, 1997

Lesourd J.B. (2001). *The environment in corporate management*. Cheltenham, Edward Elgar.

Madu C. (2000), *Handbook of environmentally conscious manufacturing*. Boston. MA. Kluwer Academic Publishers.

Marcus A.A. (2004), *Research in strategic environmental management*. A concept paper. Paper presented at the GRONEN Research Workshop, Granada.

Marty S. (1995), *EPA: An Introduction to Environmental Accounting as a Business Management Tool: Key Concepts and Terms*. United States Environmental Protection Agency. Washington D.C.

Mathew M.R. (1997), Twenty-five years of social and environmental accounting, *Auditing and Accountability Journal*, 10(4), 481-531.

Merchant K.A. and W.A. Van der Stede (2003), *Management control systems. Performance measurement, evaluation and incentives*. Harlow, Pearson Education.

Milne M.J. (1996), *On sustainability: the environment and management accounting*. *Management Accounting Research*, 7(1), 135-161.

Murray P.C. (1999), Inching toward environmental regulatory reform: ISO 14000. *Much ado about nothing or a reinvention tool? American Business Law Journal*, 37(1), 36-71.

NAE (1999), *Industrial environmental performance metrics: challenges and opportunities*. Washington DC. National Academy of Engineering.

NDCEE (1999), *Environmental cost analysis methodology handbook*. National Defense Center for Environmental Excellence.

OECD (2004), *Key Environmental Indicators 2004*. Paris, Organization for Economic Cooperation and Development.

Olov O. and Per J. (2008), *Environmental Management Accounting, Management Accounting including Environmental Management- a literature review*, Handelshögskolan VID Göteborgs Universitet.

Paolo M. Perego (2005), *Environmental Management Control*, Rasboud University, Nijmegen.

Perego P. (2003), *Environmental Management Accounting and Control, Course in Sustainable Management*, Iniversiteit Van Amsterdam.

Perez E. A., Ruiz C.C. and Fenech F.C. (2007), Environmental management systems as an embedding mechanism: a research note. *Accounting Auditing & Accountability Journal*, 20, 403-422.

Pew Center on Global Climate Change (2002), *The emerging international greenhouse gas market*. Arrington, Pew Center.

Piasecki B.W., K.A. Fletcher and F.J. Mendelson (1999), *Environmental management and business strategy: leadership skills forth 21st century*. New York, Wiley.

PriceWaterhouseCoopers (2004), *Implementation in member states of the Commission recommendation on treatment of environmental issues in companies' financial reports*. Hellerup, DK, PriceWaterhouseCoopers.

Reinhardt F.L. (1999), Market failure and the environmental policies of firms. *Journal of Industrial Ecology*, 3(1), 9-21.

ReVelle C. (2000), Research challenges in environmental management. *European Journal of Operational research*, 121(1), 218-231.

Romm J.J. (1999), *Cool companies: how the best business boost profits and productivity by cutting greenhouse gas emissions*. Washington DC, Island Press.

Ryan B., R.W. Scapens and M. Theobald (2002), *Research method and methodology in Finance and accounting*. London, Thomson Learning.

Sarkis J. and A. Rashid (1995), *Greening The manufacturing function*. Business Horizons, 38(5), 17-27.

Schaltegger S. and R. Burrit (2000), *Contemporary environmental accounting. Issues, concepts and practice*. Sheffield, Greenleaf Publishing.

Schot J. and K. Fisher (1993), *Introduction: The greening of industrial firm, in: Environmental strategies for industry: International perspectives on research needs and policy implications*. Edited by K. Fisher and J. Schot, Washington Dc. Island Press, 3-33.

Sharma S. (2002), *Research in corporate sustainability: What really matters? In: Research in corporate sustainability: the evolving theory and practice of organizations in the natural environment*. Northampton, MA, Edward Elgar Academic Publishing, 1-29.

Sroufe R.P., S. Curkovic, F. Montabon and S.A. Melnyk (2000), The new product design process and design for environment. *International Journal of Operations and Production Management*, 20(2), 267-291.

Starik M. and A.A. Marcus (2000), Introduction to the special research forum on the management of organizations in the environment: a field from multiple paths, with many changes ahead. *Academy of Management Journal*, 43(4), 539-546.

Starik M. and G.P. Rands (1995), *Weaving an integrated web: Multilevel and multisystem perspectives of ecologically sustainable organizations*. *Academy of Management Review*, 20(4), 908-935.

Strobel M. (2001), *Flow Cost Accounting*. Augsburg, Germany: Institute for Management and Environment.

The Global Compact (2004), *Who cares wins. Connecting financial markets to a changing world*. New York United Nations Financial Sector Initiative.

Trucostplc and Environmental Agency (2004). *Environmental disclosures in the FTSE All share*. Bristol UK, Environmental Agency.

UNCTAD/ISAR (2002), *A manual for preparers and users of eco-efficiency indicators: conceptual framework and guidelines*. Geneva, United Nations Conference on Trade and Development Intergovernmental Working Group of Experts.

UNSD (2002): Improving Government's Role in the Promotion of Environmental Managerial Accounting, United Nations, New York, pgs.14, 39.

United Nations (2001), *Environmental Management Accounting Procedures and Principles*, New York, USA.

Vaivio J. (1999), *Exploring a "non-financial" management accounting change*. Management Accounting Research, 10(4), 409-437.

VNCI (2001), *Guideline for Environmental Performance Indicators for the chemical industry*. Leidschendam, Association of the Dutch Chemical Industry.

White A. (2005), New wine, new bottles: The rise of non-financial reporting, *Business for Social Responsibility*, June 20.

Willing J. (1994), *Environmental TQM*. New York, McGraw-Hill.

Yin R.K. (2003), *Case Study research. Design and methods*. Thousand Oaks, CA, Sage Publications.