

Abstract – please write around 300 words

Introduction

Saudi Arabia industrial sector is predominantly based on industries such as oil and gas, petroleum refining, chemical and petrochemicals, mining, and iron and steel industries. These industries and their activities are a threat to the environment due to the generation of higher pollution, toxic waste and waste disposal. Therefore, they should be made more accountable and responsible for both long term and short term environmental issues.

This study attempts to provide ~~more light~~ be more specific on the concepts of Environmental Accounting followed among large capital intensive industries particularly in Saudi Arabia. The introduction chapter provides details about the reason and the need for this study. The author defines the expectations of the study and the current practices in the field. I need to see you and rewrite the abstract: AIM of the project, research question, method used and result

Literature review chapter explains about various literatures available on the subject in order to provide basic information to the reader. The author explains the concept in a simple and clear method in order to make the reader understand the concept. The awareness level of the subject in Saudi Arabia is also explained along with the details of current status and the impact of oil on environment.

Methodology chapter explains about the methodology adopted to conduct this study and the need for applying exploratory methodology in this research.

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Results chapter explains about various issues in respect to the subject and narrates the specific practices followed in the Arab countries. It also talks about the environmental hazards and its load on the economy.

Discussion chapter narrates about solutions to the issue and the best methods suitable for Saudi Arabia in order to overcome the impact of environmental issue and the use of sustainable resources utilization. It explains about the sustainable adaptation to climate change and the uses of the renewable energy to the society. This chapter further explains about the carbon cost and its impact on the economy and also explains about the risk management techniques and effective measures of reducing the risk due to hazardous activities. Also this chapter recommends methods to improve the environmental accounting procedures.

Overall this research covers entire range of the subject and enables the reader to get a holistic view about the concept and its difficulties in the practical scenario. The research also attempts to provide solutions to the problem faced by the professionals in a simple and thoughtful way.

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Chapter I - Introduction

The concept of Environmental Accounting has been growing among the corporate and governments for the past two decades. The idea of integrating environmental cost into the income -statement has been under discussion from the year 1960 (Joy 1999). It is very difficult to assess the economic value of the environment and include the values in the accounting system. The current accounting system includes the depreciation of goods and equipment which are physical in nature. We do not have any systems or methods to calculate the depreciating value of the natural resources [\(IAS standard is available\) can you look this up.](#)

Environmental Accounting is slowly catching the interest of accounting professionals (Hecht 1999, p-14). Many countries are taking continuous effort on building data on its environmental assets-. [For examples](#) Norway started its initiatives on building environment account in the year 1970 (Hecht 1999, p-15). These details [no details are shown here so revise the sentence](#) are built into their national economy and policy makers are constantly assessing the implications of these assets. It is helping the country to forecast the implications and growth prospects of the effects of environmental resources.

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[Generally accepted accounting principles, cost benefit analysis and other financial models have been well develop for use in reporting and financial decisions for investments, cost allocations, revenues and expenditure have been well developed over the years \(Aldy and Robert, 2007\). However, environmental accounting is new and still developing.](#)

Every day, managers of businesses must make financial decisions in regard to investments, cost allocations, expenses, purchasing and sales. Different tools to guide these decisions are used, including generally accepted accounting principles and formal and informal cost-benefit analysis (Aldy and Robert, 2007). Businesses are also becoming increasingly aware of environmental issues, and in some cases, starting to internalize costs borne by society. The pressure to address environmental risks comes from various stakeholders including the financial sector, governments, customers and environmental organizations (Adams and McNicholas, 2007). As a result, resources are being devoted by businesses to satisfy government regulations and the expectation of other stakeholders.

In the past, environmental issues were not a priority until they showed up as liabilities in company accounts and some environmental liabilities have exceeded the worst nightmares of management. Examples of major disasters include: Bhopal disaster in India [date](#), Exxon Valdez spill in Alaska [date](#), the Gulf of Mexico oil spill [date](#), and Love Canal hazardous waste site in New York [date](#). But some minor problems also affect business on a regular basis. A common, for example example is the leakage of an underground tank (Freeze 2000; Adams and Whelan, 2009). Today, the reality has changed and new strategies and technologies must be used to address these challenges.

Increasingly, companies need to account for environmental costs and liabilities, but because traditional accounting or accounting using generally accepted accounting procedures does not address these implications, an alternative can be found in environmental accounting (Patrick, 2006). The idea is to use the existing accounting framework to produce the required information.

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The use of environmental accounting is being advocated to assist companies in implementing their environmental policies, as well as to satisfy different stakeholders like governments and financial institutions. This study explores environmental accounting, its value, methodology and its application to large businesses in Saudi Arabia.

The Kingdom of Saudi Arabia has been growing very fast from the GDP of US\$188.4 Billion in the year 2000 to US\$434.6 billion in 2010¹ due to its increased oil revenue and economic development. This economic development coupled with population growth from 20.0 million in the year 2000 to 27.4 million in 2010 has increased its dependence heavily on its natural resources. The government also realized the impact of uncontrolled economic growth and taken specific steps to achieve sustainable development through optimum utilization and efficient management of resources. [What is the relevance between the two sentences](#) However, a report by United Nations Statistics Division (UNSD) and Economic and Social Commission for Western Asia (ESCWA) indicated that Saudi Arabia has not started programs to include environmental statistics details on its accounting (Framework for Environmental Accounting in ESCWA region, 2009, p-10). The statistics include for example water, air, land, forest, natural resources, biodiversity, pollution, mineral accounts and forest accounts. However, the country suffered with a lot of impending factors like non availability of correct data and system to record this information, lack of [institutions](#) [institutional](#) framework [and other resources like](#), finance, trained resources, poor training material etc also hindered the development of proper environmental accounting (Framework for Environmental Accounting in ESCWA region, 2009, p-13).

Environmental Conditions in Saudi Arabia:

¹. [Google public data explorer – source: World Bank, World Development Indicator](#)

Saudi Arabia is situated on the shore of Red Sea as given in the chart 1.

Chart 1. Map of Saudi Arabia



Source : Google maps

The Red Sea stretches about 1,932 km long with an average width and depth of 280km and 491 m respectively. Saudi Arabia's marine life is restricted to coastal strip which has habitats like coral reefs, mangrove and sea grass varieties (Mohamed 2009, p-11).

The climate is always hot and arid with clear sky or lightly clouded. Rainfall in this place is very little around 25.7mm and dust or sandstorm is very common which will reduce the visibility less than 100m very often. Average sea water temperature varies from 25°C to 31°C and sometime extreme surface temperature varies from 19°C to 34°C due to absence of fresh water flow and wind drift current (Mohamed 2009, p-12).

Marine Pollution: Due to the growth in the industrial development the environment is directly impacted. The following is a [sample example](#) of the environmental impact to the ecosystem in the marine life due to commissioning of power and desalination plants. Environmental impact study conducted by Dr.Mohamed A. Turki, 2009 for Dredging Operation at Shoaiba Power Plant Extension, Stage III, reveals that the dredging work will remove and or destroy the coral reef in and around the site. The dredging [operation](#)

~~will affect the eco system as it will leave some silt in the area-area, which will impact the marine life. The operation will~~ reduce the quality of water in the area ~~affect the eco system, and will~~ reduce the dissolved oxygen. Water temperature will increase slightly due to heavy discharge from the power plant. ~~The dredging operation and disposed material will reduce the quality of water which will affect the eco system.~~ In spite of taking mitigation actions by respective parties who are the respective parties the normal life will begin in the area in about 2 to 5 years of time (Mohamed 2009, p-119).

Impact of Climate Change: It is very easy to understand the severity of environmental problems through ecological footprint. Maybe useful to say how this footprint is measured (1 sentence will do or explain the range for high and low values). The world average total ecological footprint is 1.8 global ha/person whereas the Kingdom of Saudi Arabia stands at 4.6 global ha/person (Raouf, 2008, p-1). This is very high for a country and it shows the unsustainable pattern of growth and development this goes back to explaining the footprint. It was indicated in the UN Intergovernmental Panel on Climate Change that the earth has seen the warmest surface temperatures in the last 12 years and higher global average sea level. The increase in water level in the sea will directly affect Saudi Arabia. There are two immediate problems for Saudi, first is the impact to the marine life and coast lines and the impact on the desalination plants. Second issue, is the rising temperature will increase the demand for water and reduction in fresh water supply and increase in water salinity in the sea, which again affects the desalination plants (Janardhan, 2007).

Saudi Arabia is facing a difficult situation since it depends on fossil fuel which causes carbon (CO₂) emissions and the entire economy depends on oil and natural gas

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related industry. According to World Resource Institute, [date](#) Saudi Arabia ranks 22nd on carbon emissions among the countries in the world. Due to the high carbon emissions, there is a need to adopt methods and processes to tackle the environmental degradation. This calls for research and funding for identifying renewable energy, efficiency in energy utilization, clean production and technology for a clean environment in the future. However, Saudi Arabia [being as the](#) biggest oil exporter has earmarked \$300 million (Raouf, 2008, p-5) fund for the protection of environment for the future generation mainly for carbon capture and storage.

The above facts [are convincing suggest](#) that there is a need for Saudi Arabia to focus its attention towards preservation of environment. This study attempts to understand the concept of environmental accounting and difficulties in following environmental accounting in Saudi Arabia and facilitate a simple and easy to use method of environmental accountings systems for the benefit of the large organization in Saudi Arabia.

Aim of the Study: The study aims to create awareness about the concept of environmental accounting and the impact to the environment due to economic activity in Saudi Arabia.

Objectives of the study:

1. To study the concept environment accounting in Saudi Arabia
2. To analyze the impact of economic activity on environment
3. To assess the risk management measures due to environmental hazards
4. To propose solutions to the environmental accounting issues

Scope of the study: This study revolves around the environmental accounting practices followed in Saudi Arabia and the impact of environmental degradation due to its fast growth in the industrialization. The study also analyses the root causes to the environmental issues and the possible solutions in the developing world.

Limitations of the study: The concept of environmental accounting is gradually receiving attention in the economic world. ~~The awareness about this subject is considerably low~~

~~due to the complexity of the subject.~~ Largely, researchers that have focused specifically

to environmental issues in Saudi Arabia are ~~There were some researches such as~~

Magram, 2009 ~~Environmental issues relation to~~ on water pollution specifically in

Jeddah ~~by Magram in, 2009,~~ Climate climate change threats, opportunities, and the CCG

use full words countries by Raouf, M.A. in 2008 and the report on Framework for

Environmental Economic Accounting in the ESCWA Region by United Nations in 2009,

research done by Rania in 2007 on Critically Appreciating Social Accounting and

Reporting in the Arab Middle East : A Postcolonial Perspective, Advances in Internal

Accounting etc were done on this subject and the availability of the other researches on

this subject is also limited. The study did not use any of the survey methods as it used an

exploratory study methodology to create more awareness on the subject. The limited

availability of the literature on the subject with special reference to Saudi Arabia is also

another limitation to this study.

Chapter II – Literature Review

What is Environmental Accounting?: Environmental Accounting means a well

structured system of organizing information on the availability, use, its value ~~and,~~ the

assets ~~and,~~ the expenditure on the protection of the resources and its management.

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[reference](#) The international organizations [who are the international organisations](#) are categorizing the resources into four major types such as account of natural resources, account of pollution and material physical flow, monetary and hybrid account and environmentally adjusted macroeconomic indicators (Environmental Accounting, 2010, p-8). The environmental accounting is designed to provide a connection to the environmental data with the economic data of a country. The objective of environmental accounting is to constructively integrate environmental issues and development needs in order to create awareness and fulfill the needs for improved environmental conditions due to the impact of its consumption. It can provide detailed information to the decision makers on the environment and its impact on the people and other statistics about the contribution to the economy. It can also serve as a method for understanding the implications of the policy and regulations on the economic activities and the sustainability level of the available resources. [ok](#)

Environmental Accounting Framework: The structural framework of environmental accounting is consist of varied and even conflicting goals of stakeholders and the information relates to financial impact influenced by environment and impacts of physical environment. [- rephrase for clarity](#) Since the accounting system is dealing with different issues and it has to include different tools to handle different stakeholders (Stefan & Roger, 2000, p-59). ~~It~~ [it](#) can be structured to provide information to different people in different aspects. The Table 1 given below shows that the key stakeholders and the categories of accounting systems related to them. The major categories are conventional accounting and ecological accounting. The issues related to environment are

accounted in the environmental account and at the same time environmental accounting covers issues in conventional accounting and ecological accounting.

Table 1. Framework of Environmental Accounting

Stakeholders (examples)	Conventional Accounting			Ecological Accounting		
	Management	Financial	Other	Internal	External	Other
Management	●	●	○	○	○	○
Shareholders		●	○		○	
Tax agency		○	●	○		○
Creditors		●	○		○	
Ecological rating agency		○	●		●	
Environmental protection agency	○		○	○	●	○
etc.

- Environmentally differentiated accounting (in monetary units)
- Ecological accounting (in physical units)
- + □ Environmental accounting (Environmentally differentiated accounting + Ecological accounting)
- (Historically) most important accounting system for communication, analysis etc with respective stakeholder
- Additional accounting system for communication, analysis etc with respective stakeholder

Source : Stefan & Roger 2000, p-59

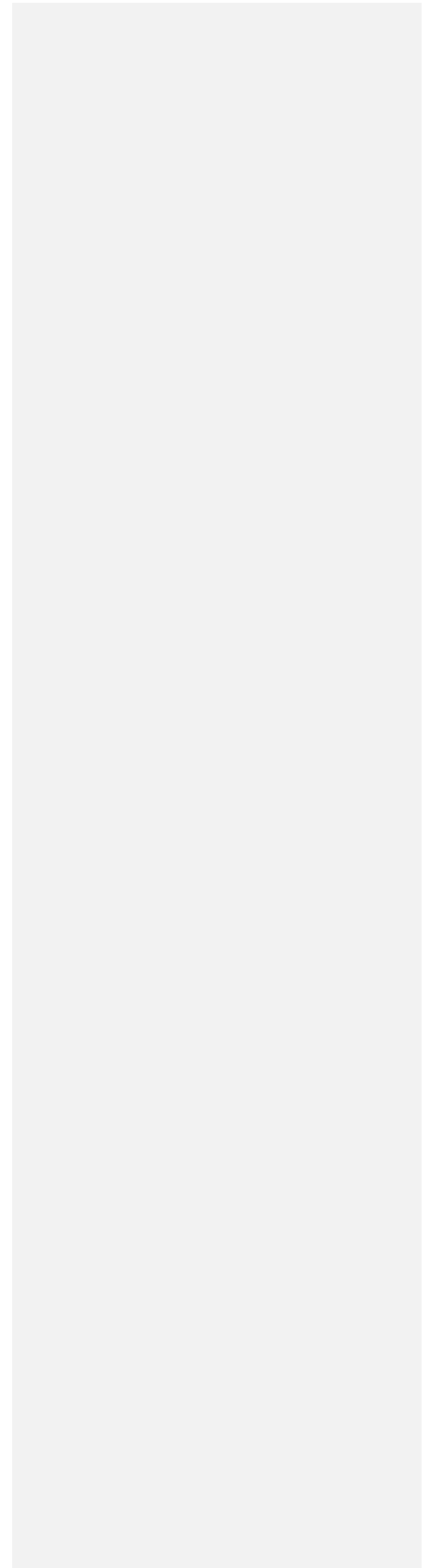
[You have used ecological accounting, is this the same as environmental accounting?](#)

Influence of Stakeholders in Environmental Accounting: There has been a growing attention on the environmental accounting practices and it is influenced by different groups. The table 2 ~~given below~~ explains about the influence of different groups and the systems developed to provide information on the performance of environmental initiatives. The only way to sustainable development is to measure the impact and calculate the number for comparison of environmental issues. The assessment of total

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damage due to various processes, products, companies, regions and countries will help to understand the overall condition of the environmental impacts.

Table 2. Different Stakeholders of Environmental Accounting



Stakeholder group	Type of accounting affected	Specifications for accounting	Characteristics
Regulatory bodies			
US Securities and Exchange Commission	Financial (Part 2, Chapter 5)	Very Specific	Legally binding for firms listed on a US stock exchange
Department of Ecology (Washington DC)	Management (Part 2, Chapter 4)	Very Specific	Guideline accompanying a regulation
European Union (Eco-management and Audit Scheme and Eco-label)	Site, Product or Ecological (Parts 3 and 4)	General	Voluntary
Professional accounting and financial analysts' associations			
European Federation of Financial Analysts' Societies	Financial, external, ecological (Parts 2 and 3)	Specific	Statement and demand of financial analysts
UK Association of Chartered Certified Accountants	Financial (Part 2)	Specific	Environmental reporting awards
Australian Society for Certified Practising Accountants	Management (Part 2)	General	Environmental management
Federation des Experts Comptables Europeens	Financial (Part 2)	Specific	Framework for environmental reporting, guidelines for external ecological accounting and reporting
Society of Management Accountants of Canada	Management (Part 2)	Specific	Writing environmental reporting
Canadian Institute of Chartered Accountants	Conventional (Part 2)	Specific and general	Statement of professional accountants
Accounting Standardisation Organizations			
International Accounting Standards Committee	Financial (Part 2, Chapter 5)	Specific	Topic has not been dealt with so far
US Financial Accounting Standards Board	Financial (Part 2, Chapter 5)	Very Specific	Strong influence of US Securities and Exchange Commission
Other Standardization Organisations			
British Standards Institution	Management, Ecological (parts 2-4)	General	Focus on environmental management systems
International Organisation for Standardisation	Management, Ecological (parts 2-4)	General	Focus on environmental management systems

Table 2. continued...

Stakeholder group	Type of accounting affected	Specifications for accounting	Characteristics
Industry			
International Chamber of Commerce	General Environment (Part 1)	Very general	Starting point for environmental management
Minerals Industry	Ecological (Part 3)	Specific	Voluntary code of environmental management
Chemical Industry	General ecological (Part 3)	Very general	Starting point for environmental management, responsible care and voluntary code of conduct
Green Organisations			
Coalition of Environmentally Responsible Economies / Global Reporting Initiative	External Ecological (Part 3, Chapter 12)	Very general	Addresses environmental interests of potential investors ; voluntary
Sustainability	Environmental reporting (Part 3, Chapter 12)	Specific	Provides pro forma categories for assessing environmental reports
World Wide Fund for Nature	External ecological (Part3, Chapter 9)	Specific	Addresses green stakeholders
Scientific Certification Systems	Product and external ecological (Part 3)	Specific	Addresses green customers
Other International Organisations			
United Nations Environment Program	General Environmental (Part 1)	Specific intentions	Addresses corporations in UN countries
United Nations Centre for Trade and Development	General Environmental (Part 3, Chapter 12)	General	Environmental Performance Indicators
United Nations Inter-governmental Working Group of Experts on International Standards of Accounting and Reporting	Financial, external, ecological (Part 2 and 3)	Specific	Guidelines for financial and ecological reporting
Tellus Institute	Management (Part 2)	Specific	Full-cost accounting; total cost accounting; 'green' metrics
World Bank	Internal ecological (Part 3)	Specific to different sectors	Environmental assessment for scenario planning
World Resources Institute	Management, External, Ecological (Parts 2 and 3)	General	Corporate environmental performance, environmental costs
World Business Council for Sustainable Development	Goal, Management, Ecological (Part 1-3)	General	Eco-efficiency, shareholder value, environmental metrics
Organisation for Economic Co-operation and Development	Ecological (Part 3)	Very general	Addresses multinational in OECD countries; eco-efficiency

Source : Stefan & Roger 2000, p-66

Types of Environmental Accounting: There are four categories of accounts in the environmental account as described by the international bodies.

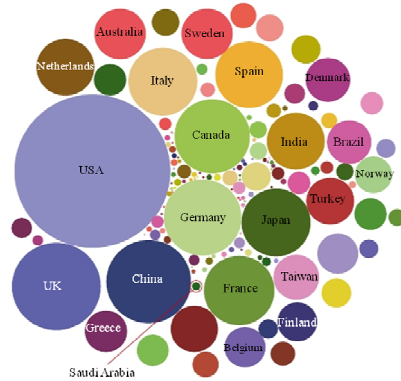
- i) **Natural Resources Asset Accounts** is attempting to list down the availability of natural resources. This account focuses on maintaining stocks including changes due to economic activity and natural processes. These accounts can track the changes in the physical asset's availability and sustainability of resources due to the changes in the policy (Environmental Accounting, 2010, p-9). Monetary asset accounts are used to represent the value of the asset into monetary value and translate into total wealth of the country.
- ii) **Pollution and Material Physical Flow Accounts:** This account provides information about the quantity of resources utilized for economic activity and pollution levels due to the result of economic activity. Also this account provides information on the pollution due to the movement of material from one place to another and one country to another country etc (Environmental Accounting, 2010, p-10). In addition to that the account provides data on how inputs are transformed into products, waste and pollution etc and the final accumulation to the economy or to the environment.
- iii) **Monetary and Hybrid Accounts:** The focus of this account is to provide information on the activities related to management and protection of resources and the contribution of the environmental services industry. This account provides information on the money spent by the government and

industries to protect the environment and its management. It captures data on the goods and services of the industry and its contribution to the economy (Environmental Accounting, 2010, p-11). The taxes and fees collected by the authorities towards pollution emissions and utilization of the resources. It also captures the monetary value of the cost and its benefit to the environment and the pollution developed by the activity. It captures physical and monetary details in a single account.

- iv) ***Environmentally-adjusted macroeconomic aggregates:*** This account captures the details of income and product in order to assess the health and economic progress of the environment. The aggregate of the economy is used to correct the GDP in order to include the cost of environmental degradation and pollution due to economic activity.

Environmental Awareness in Saudi Arabia: Saudi Arabia is one of the top oil exporters to the world. This top position is instrumental for the growth and development of Saudi Arabia and at the same time it is creating many environmental issues too. However, awareness in the country on the need to protect its environment was comparatively less.

Figure 1. Environmental Publication



Source : Strategic Priorities for Environmental Technology Program, Ministry of Economy and Planning, Kingdom of Saudi Arabia, 2008

As shown in Figure No. 1, it was found that 11,369 articles were released worldwide related to Saudi Arabia’s energy research in the year 2005 – 07. USA was one of the major producers in the world at about 2,760 articles whereas Saudi Arabia produced only 12 articles. Further breakdown of the articles reveals that the air pollution monitoring system accounts for the highest of the topics among the environmental subject as given in the Table 3. The other important topics were on greenhouse gas emissions, municipal solid waste management etc. [good](#)

Table 3. Publication of Environmental Sub-Topic

Sub-Topic	Publication
Air Pollution Monitoring and Assessment Technologies	3888
Food Contamination Avoidance Technologies	3440
Greenhouse Gases - Avoidance, Monitoring and Assessment Technologies	2673
Municipal Solid Waste Remediation Technologies	2464

[source](#)

Hence, it is evident from the above details that the country needs to go a long way in addressing the issue of environmental degradation.

Current Status of Environmental Accounting: Different countries are implementing various policies towards environmental accounting. As business grows to the next level with the foreign direct investment of US\$ 21.56 billion in 2010 compared to the US\$-1.88 billion in the year 2000 (Google public data explorer – source: World Bank, World Development Indicator) and increase in globalization and industrialization happens around the world, the impact to the environment is also increasing. This situation created a need for corporate to report its environmental impact along with their financial reporting. This action from corporate will create a visibility on the effect of environmental changes and the consequences of business become evident. The environmental accounting will also help to reduce the negative impact on environment or totally stop the impacts. Hence the level and breadth of business reporting on environmental issues has been increasing for the past 20 years (Heba & Yousef, p-3). This is primarily happening due to the increase in governmental regulations; changes in the accounting style and expectation from the stakeholders and voluntary reporting.

However there is no regulation in any country mandating companies to submit a standalone report on environmental impact it creates. Some of the similar legislative requirements available are one in Sweden which requires the companies with a presence of environmental hazards, to submit an annual report on environmental report to the authorities. In 1996, companies in Denmark with significant impact on environment were

required to submit a green account detailing the utilization of power, energy, water and other resources. A recent study conducted by Maasland KPMG in 2002 reveals that many companies among global fortune companies are reporting the environmental impacts of its operation (Heba & Yousef, p-4).

A company governed under Annual Accounts Act (AAA) is mandated to disclose the environmental impact of its operations and also disposal and use of its products in the director's report. In European Community, companies were required to disclose many non-financial information connected with environmental issues to enable the users to understand the environmental liabilities of the company (Hibbit and Collison, 2004; PwC, 2004). In May 2005, the UK Accounting Standards Board (ASB) issued a reporting standard 1 known as Operating and Financial Review (OFR). This standard requires the companies to include information relating to environmental impact wherever possible. In the EU, the modernization directive 2003/51/EC required that all the listed companies in EU member state move to the international accounting standard reporting. Similarly Australia also passed regulations to report environment issues in their annual financial statement.

Similarly, in the US also the Securities and Exchange Commission (SEC) and American Institute of Certified Accountants (AICPA) had issued various notifications to companies to disclose environmental impacts in their annual financial statements. Many companies and organization interested on environmental protection have accepted the principals of Coalition for Environmentally Responsible Economics (CERES 2000). As per CERES 2000 these principals companies accept to adhere to report the progress of its environmental goals such as eco-management and audit scheme registration, conducting

environmental review, implement an effective environmental management system, conducting environmental audit, reporting environmental progress etc (Heba & Yousef, p-6).

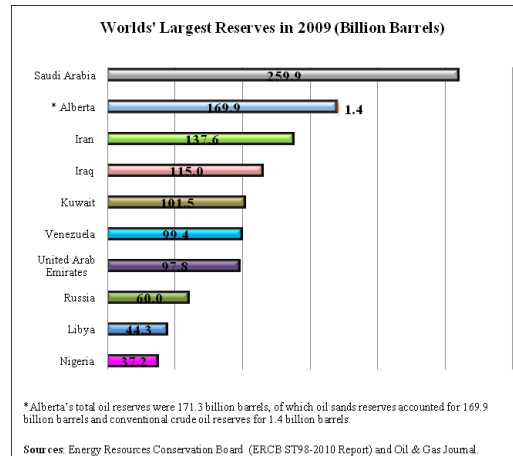
The International Organization for Standardization (ISO) also constructively progressing through its standards like ISO 9000 which is on quality management, ISO 14000 which deals with the management of environment and ISO 14001 which is specifically addressing the issues of environment management systems (Heba & Yousef, p-6).

Environmental and Social Impacts of Oil

It is roughly estimated to be 40,000 oil fields in the world and about 4,000 new licenses are issued in the last 10 years. Oil exploration is one of the complicated and expensive processes in the world (Dara & Sarah, 2003, p-593). Oil reserves are identified through remote sensing techniques and they build roads, bridges, platforms, pipelines, bring in crews, drill exploratory test wells etc. Oil exploration is done using various techniques of drilling using different explosives which produce a lot of hazards to the environment. Impacts include deforestation, destruction to the ecosystem around the site, contamination of chemical and other substances in the site, disturbances to the animals and human health and displacement of local communities etc. The water usage during drilling and exploration is very high and this water contaminates the area which includes chemical contamination, petroleum waste, solid and liquid waste, toxic chemicals etc (Dara & Sarah, 2003, p-594). On and off shore oil production process is creating a large amount of air pollution and health hazards to human beings. It was estimated roughly that

20% of hazardous waste produced in the US are due to oil exploration and production (Dara & Sarah, 2003, p-594).

Figure 2. Largest Oil Reserves in the World



As per the Figure 2, Saudi Arabia stands on top of the oil producing countries in the world. Oil extracted from the oil well is generally separated to a large extent from the place of human habitation. Hence it requires to be transported to longer distance through oil tankers, huge containers, super truckers and pipelines. The transportation of oil from one place to another leads to oil spill though out the travel. Many major oil spills like Exxon-Valdez spill, Prestige Oil tanker that split into half, Nowruz Field, Persian Gulf etc (Dara & Sarah, 2003, p-599) are published and the spills from ships, pipelines, leaks, other smaller spills are going unnoticed and undocumented. The other environmental impacts are oil sledge, water contamination, solvent degreasers, contaminated product etc. Saudi Arabia being the largest oil exporter in the world we could imagine the amount of stress it creates on the environment.

Role of SEEA (the System of Environmental – Economic Accounting) in Environmental Accounting:

There have been consistent efforts by many international bodies including the Organization for Economic Co-operation and Development (OECD), International Monetary Fund (IMF), European Union (EU) and World Bank to make environmental information available to the policy makers and plan for the sustainable growth and development in the countries (Environmental Accounting, 2010, p-14). These efforts helped to bring out a systematic discipline to the compilation of environmental statistics. The approach led to the development of a handbook known as System of Environmental and Economic Accounts 2003 (SEEA - 2003). The handbook contained many different approaches including the best practices followed on environmental accounting systems and the advantages and disadvantages (Environmental Accounting, 2010, p-14). UN has supported the SEEA through its various publications especially one on natural resources like fisheries, water and energy and the other one is on material flow accounts.

United Nations Committee of Experts on Environmental Accounting is now working with experts to revise the SEEA – 2003 in order to further improve the environmental accounting standards (Environmental Accounting, 2010, p-15). The improved SEEA will comprise of three parts such as internationally standardized and accepted accounting approaches, useful approaches but non-standardized and third is on uses and potential applications of environmental accounting policies. The improved SEEA will help the decision makers and experts to follow a uniform approach on environmental accounting system throughout the world.

Environmental Costs: Any aspect of environment is useful could be considered as utilization of goods and service and this activity can be considered as environmental cost (Stefan & Roger 2000, p-96). The monetary and non-monetary impacts of the environment on the society can be considered as economic costs. The impacts can be internal or external on the environment based in the factors inducing the impact. The Table 4. shows the different costs of the environment and the impact on the society.

Table 4. Classification of Environmental Costs

Source : Stefan & Roger 2000, p-101

External and Internal Environmental Costs	
External Environmental Costs	
<ul style="list-style-type: none"> • Depletion of natural resources • Noise and aesthetic impact • Residual air and water pollutions 	<ul style="list-style-type: none"> • Long-term waste disposal • Uncompensated health effects • Change in local quality of air
Internal Environmental Costs	
Direct or Indirect	Contingent or Intangible
<ul style="list-style-type: none"> • Waste management • Remediation costs or obligations • Compliance costs • Permit fees • Environmental training • Environmentally driven R&D • Environmentally related maintenance • Legal costs and fines • Environmental assurance bonds • Environmental certification / labeling • Natural resources inputs • Record-keeping and reporting 	<ul style="list-style-type: none"> • Uncertain future remediation or compensation costs • Risk posed by future regulatory changes • Product quality • Employee health and satisfaction • Environmental knowledge assets • Sustainability of raw material inputs • Risk of impaired assets • Public / customer perception

Accounting the Cost of Pollution:

It is very difficult to assess the pollution generated in the environment. Generally the information on pollution is obtained from the permits issued by the regulatory process

and the reporting requirements of the organization. Often this information may not be accurate as it only talks about the maximum limits (Hecht 2007, p-21). Moreover these requirements are applicable only to the large organizations and the pollution created by small organizations may not get recorded. Italy followed a system of CORINAIR to record the physical pollution accounts for 10 common pollutants. The information were recorded by the industrial process and whereas SEEA required the accounts recorded by industry. This resulted in a difficulty of understanding the actual pollution level (Hecht 2007, p-22). The second difficulty was that the CORINAIR recoded only the emissions happening in Italy and not the emissions created outside of country by resident companies in Italy. Third challenge was the difference between the classifications by SEEA and the Intergovernmental Panel on Climate Change (IPCC). As per the IPCC requirements the emissions released by the organizations are recorded only in their location and the emissions released in the international air or water was not recorded against any country (Hecht 2007, p-22).

It is a million dollar question that how much we can spend to protect, prevent or control the pollution. Hence it is important to understand how much money is being spent now on protecting the environment. Generally expenditure spent on environmental protection shall cover prevention of pollution, effective management of resources and the protection against the natural disasters. As per Environmental Protection Expenditure Accounts, goods manufactured to protect the environment, purchase of those products and the expenditure on restoring the damage created by environment are considered as expenditure on environment. Basically any expenditure is considered if the action primarily intended to protect the environment and not as a result of other purpose. Many

countries are accounting the expenditure on environment by public sector and the expenditure by private sector is not accounted properly (Hecht 2007, p-26).

These challenges are posing a huge burden to the countries to track and assess level of pollution and the amount spent on protecting the environment.

Natural Resource Asset Accounts:

The asset is classified under two categories as per System of National Accounts (SNA) which are assets owned and the asset should produce economic value to the owners. The benefit either by man-made or by derived naturally. As per this definition the SNA does not cover the wild resources which are not owned like ocean and the fisheries etc. However the SEEA includes the assets which are terrestrial, aquatic and atmospheric ecosystems. The system under SEEA has a provision of accounting the intangible items like tradable emission permits, natural resources like fish, mineral etc. All countries have built the physical asset accounts based on the availability of physical data. Building monetary accounts for these assets are difficult due to the non-availability of suitable methods of assessing natural resources. These challenges led the countries to build only physical asset accounts.

However several methods have been in force to assess the value of the natural resources. As per the net price method, it is calculated by subtracting the cost of harvest from the net price or rent of the asset. The value is multiplied by the total stock of the asset. The following is an example for the calculation (Hecht 2007, p-36).

Stock value = quantity X net price (or rent) per unit sold in that year.

The net price is calculated as net price = marginal revenue – marginal cost of extraction.

Marginal cost of extraction = intermediate consumption = cost of labor + return on fixed capital + depreciation of fixed capital + depreciation of natural asset.

Depreciation of asset = depreciation in time (T) = net price in time (t) & Quantity extracted in time (t).

However there are several other methods available to assess the value of natural assets.

- i) **Forest Accounting:** Forest Account should focus more on depletion as the usage more than the sustainable level is considered as depreciation of capital. It should account the non-timber products and other related environmental services offered by forest land (Hecht 2007, p-38). The forest grows on land and the area is counted as hectare or acre. The trees and non-timber products can be assessed through the measurement of area. However the benefits due to its biodiversity and habitation by area are misleading and not the correct way of assessing the value of forest.
- ii) **Mineral Accounts:** There is a fear that the minerals will run out of stock if we are not made progress on sustainable way of extracting minerals. Another issue, the society is not capturing the rent from the mineral extraction properly or let it allowed in the hands of private hands (Hecht 2007, p-42). Third issue is the sustainability of mineral income to the economy. These questions provide valuable data for the reinvestment for the sustainable development of mineral resources.
- iii) **Fisheries Accounts:** It is one of the major environmental issues which need to be managed through its development and flow accounts.

Overfishing is one of the issue since the resources is open to access for everyone. It is also difficult to assess the fishing is within the sustainable limit or not (Hecht 2007, p-47). Due to many players in the field, they all want to invest in equipment and machineries and in return they will try to maximize their profit. This will lead into resource depletion in the long run. Overall the activities will create a lot of stress on the coastal areas since the trade and business related to fisheries happening on the coast.

- iv) **Land Accounts:** It is very difficult to assess the value of the land as it does not have a standard process. The land degradation happens due to urban development and growth in the industrial development etc (Hecht 2007, p-50). Many countries are using the land used by industry and in addition to that land used for transportation etc.
- v) **Water Accounts:** The utility of water is dependent on its quality and it is much difficult as it is widely available underground. The water account primarily focuses on its exchanges between economy and environment (Hecht 2007, p-53). Water is normally not sold and the charges are normally for treating and processing of the water from one form to other. Large amount of water is used in the hydro power industry and it is returned after its purpose is over. However this process generates lot of heat energy it is sometime harmful to the environment. Water discharges from the industry is not properly treated and allowed as residual many times. This residual water contaminates the environment and further pollutes other resources. Water used in the agriculture industry also

accounts for major environmental degradation as it is not flowing back to the system directly. The water accounts are providing to the total of the national resources and it is not properly organized. This problem poses a limitation to the water accounts.

Macroeconomic Indicators: Environmental Account has been emphasizing the need on green GDP, welfare initiatives and actions on sustainable income. The SEEA explains different models to assess the proposed economic structure if the damage to the environment is prevented. SEEA captures the harm created to the environment and also finds the ways and means of adjusting the asset account to capture the degradation and depletion to the environment. It captures the change in the value of human due to illness caused by the impact of degradation in environment (Hecht 2007, p-59). Finally the SEEA suggestion on adjusted macroeconomic indicators is that the adjusted saving measures in place of adjusted income by countries.

The World Bank has done the calculation on adjusted net savings for many countries for the period 1970 to 2001 and Saudi Arabia scored -14.9% compared to 29.2% for Singapore. However, it is very difficult to calculate a correct and meaningful measure of green GDP (Hecht 2007, p-62).

The Future of Environmental Accounting: The subject Environmental Accounting is evolving and its frame work needs to be refined and improved. The SEEA 2003 is undergoing changes in order to improve its methods to exactly assess and provide valuable statistics to environmentally sensitive countries. The London Group and United Nations Statistical Division has created and few forum of Committee of Experts on Environmental Accounting to help and support the development and implementation of

environmental accounts. The objective of this forum is to develop SEEA as an international standard for environmental accounting and harmonize the other statistical systems and create awareness and implementation of environmental accounting in majority of the countries including developing nations.

Chapter III – Methodologies =

There are different types of research methods based on the objective of the research. This study used exploratory research design using qualitative and quantitative research tools to understand the subject and analyze the impact of environmental degradation due to growth and development in Saudi Arabia. The concept of mixing two different methods started in 1959 by Campbell and Fiske for their study on validity of psychological traits (Creswell 2003). They used both qualitative and quantitative methods to collect data for their study in order to collect more accurate information on the issue.

The data collection was done using case study, observation method and focus group to understand the current state, practices followed in different companies etc. In addition to this the researcher would collect secondary sources of information from empirical evidences and previous research done on this subject and reports of various institutions at national and international level.

Types of Research Methods

Case study: This is one of the strategies that can be used when researching the questions of "how" or "why" something is done. This is especially true when the researcher concentrates on real life circumstances; a contemporary phenomenon or has little control over the events being explored (Yin, 2002). In this case the researcher has little power over operational events and the evaluation of the accounting practices in an environmental context is a contemporary issue. Therefore the applicability of the case study approach is the best way to address this study.

Case studies allow researchers to bring a concrete orientation to the study. This in turn allows the research to provide a more meaningful example for those seeking information on environmental accounting. It should be noted that limitations to case study methodologies have been identified. But environmental accounting is a field in which relatively little research has been conducted, especially on the companies in Saudi Arabia. There are no standards defined and there is much research to be done before agreement on key issues is achieved. Therefore this study has exploratory value, in providing an example of how environmental accounting can be developed for a real example.

Document Analysis: This method was used to collect different secondary data related to the policies and procedures enacted by the government and companies on the environmental accounting processes. Also it will help to understand policies and guidelines followed in the companies for the protection of environment. Through the analysis of these documents, the researcher can interpret valuable information related to the clarity on the policy and the role of companies and the government in implementing best policies to protect environment for the future generation.

Focused Group: It is one of the other methods used in this study to collect data from the research participants. This method is very much useful to understand participant's knowledge and experience in implementing environmental accounting procedures and the difficulties faced with the process (Kitzinger 1995). The idea behind the focused group is that the advantage of group process can help the participants to discuss about environmental accounting principles. It is normally not possible to interact with many

through one to one discussion (Morgan 1998). This method helped the researcher to understand what are the difficulties companies facing and the approach of the management on environmental protection etc.

Observation of Records : It is a form of naturalistic enquiry by the researcher to get more accurate and real time information though observing the documents. Observation of records helped the researcher to understand the current practice of companies on environmental issues and the information which was not expressed through other sources (Marshall & Rossman 1995). A good observation study should consider the location of the study, opportunities available for better observation, the demography of the participants, key areas and people for observation and the recoding methods etc (DeWalt & DeWalt 2002).

Informal Interaction

The researcher discussed with the managers and accountants in different companies about their experience in implementing environmental policies and also this informal discussion helped the participants to discuss about the reality and their concerns on the implementation of environmental accounting in their companies.

Research Diary

The researcher recorded all the incidents and observations during the visits and supervisions to various companies and government departments. The purpose of the research diary was to keep track of the changes happening every day and new ideas and difficulties during the study (Hopkins 2008).

All the different research methods helped the researcher to collect different data from different participants and sources. This system improved the accuracy

of the information collected and also enabled the researcher to cross verify the facts and figures provided by the respondents. It was a very good opportunity for the researcher to understand the reality in person and provided valuable information on the issue and the possible solution to those issues.

Ethical Consideration of Research

Researchers are working with various elements of economic, social, political, legal and cultural settings for their work. There are still debates going on to address the issues of accountability of the researchers (Romm 2000). However the main consideration on ethics in research is to protect the interest of the participants (Miles & Huberman 1994) and protecting the interest of the society at large.

The researcher is strictly guided by the following ethical considerations in the study. The researcher would obtain the consent of the participant orally and in written before the start of the participation in order to make clear of the objective and implications of the study. Data gathered during the study will be protected in line with the local and international regulations and the identity of the participants will not be shared with any other parties without obtaining permission from them. Also the study will communicate the potential benefits and hazards (Ethical Guidelines by SRA 2003) to all the participants in advance and also suitable mitigation measures will also be taken care. The title, objective and expected duration of the study will be communicated to all stakeholders. The procedures and check points to monitor the progress of the study and dissemination of the result will be established in line with the guidelines.

Chapter IV – Results of the Study

Problems in Environmental Accounting: The major problem in the environmental accounting is that none of the approach on environmental accounting is accepted by international bodies. [Reference](#) The reason for this bottle neck is due to the absence of agreement to follow a uniform approach for assessing the value of environmental assets and its usage. Even though the SEEA 2003 has been accepted by UN Statistical Commission and adopted by five major multilateral organizations, none of the country has followed all the components of SEEA (Xia et al 2006, p-36). Countries are adopting specific policies pertaining to their own situation and following some of the guidelines of SEEA. There are major differences in the environmental accounting systems available and the current practices in different countries due to its complexity and multidimensional nature. The following are major obstacles for establishing environmental accounting system.

Currently there is no system to assess the value of the natural resources and environmental asset. Since there is no standard available for valuation, it becomes difficult to convert the asset into economic value (Xia et al 2006, p-36). The damage caused to human being due to environmental degradation/pollution and estimating the value of the damage is difficult (Xia et al 2006, p-36). Valuation of pollution is much more difficult in the real term. There were several researches happened on assessing the value of pollution and still there is no transparent and comprehensive method of estimating the economic value of the damage (Xia et al 2006, p-40).

Status of Environmental Reporting in Arab Middle East: Environmental reporting is not a common practice among companies in the Arab world. A study conducted among 68

companies in Arab Middle East countries to understand the reporting structure of their environmental disclosure. As per the study we could understand that only 15% of the companies are disclosing their environmental status in the report (Rania 2007, p-125). However the disclosure is only on the positive side of their environmental impact and no evidence was mentioned about the negative impacts.

Table 5. Disclosure for Four Dimensions of Social Accounting

Dimension	Companies	
	Number	%
Economic	47	69
Environmental	10	15
General Social	62	91
Other Social Characteristics of reports	35	53

(Source : Rania 2007)

These disclosures were very peculiar to their cultural importance in Arab counties. This information was included on voluntary basis except the information required under law in Saudi Arabia. Many of the service and financial industries were barely mentioning about the environmental impact whereas the oil and industrial sector were the environmental impact is direct had mentioned about the environmental performance.

The companies disclosed about the environmental performance stressed on the positive or neutral side of the company's environmental management and control.

Table 6. Details of Disclosure under Environmental Category

Categories	Companies	
	Number	%
Energy	3	4
Water	4	6
Waste	2	3
Pollution control	5	7
Sustainability	1	1.5
Material usage (other than fuel and water)	0	0
Transport	0	0
Habitat protection	1	1.5
Land use/biodiversity	2	3
Environment management and control	6	9
Other environmental disclosure	9	13

(Source : Rania 2007)

It is evident from table 6 that the companies are disclosing on the environmental category are very less. The disclosures on energy, water, waste and land use were available only few companies ranging from 2 to 5. Only two companies provided evidence on environmental audit and systems and four companies complied with national and international standards. Only one company declared information on the incidents relating to the environmental impacts (Rania 2007, p-135). As per Saudi Aramco Annual Report in 2000 there were evidences on the efforts taken by company on conservation and reduction in energy utilization. It also declared as highest priority to ensure protection of water resources for the benefit of the country.

Environmental Hazards: According to Franklin, environmental hazards should be managed at international, national, regional level (Franklin 2011, p-4) for effective implementation and mitigation of the risk. The community based risk management at the regional level will help a lot in managing the risk and get relief at the time of any environmental hazard. The regulatory support on providing the guidance on the land use and construction quality etc will reduce the impact of environmental risk. It is important

to map the area which is exposed to flood, coastal flooding, landslide, wind and earth quake etc. The regulatory process should educate the builders and community to follow the building codes and the importance of safety risk due to negligence. The knowledge about the building code by the community will facilitate the implementation of the code at community level (Krimgold 2011, p-58). The investors and the financial community also should be educated to follow these building codes and ensure compliance before supporting those buildings for better risk management system.

Environmental Load: The environmental Load is derived as the ratio of the use of non-renewable and renewable resource. This ratio reflects the pressure on the environment due to various kinds of pollution. This environmental load is very important to assess the sustainability of the country. A country is considered sustainable only when the country is able to facilitate development continuously while equally reducing the environmental degradation (Matthew et al). Saudi Arabia is in 92nd place in the global ranking on sustainability index. This shows that the non-renewable resources are highly depleted due to the excessive use and other environmental degradation.

Case Study Report : The research was done using case study as one of the methods to understand the practical implications of environmental accounting in larger industries. Saudi Basic Industries Corporation (SABIC) was one of the leading capital intensive large industries in Saudi Arabia and the researcher decided the practices followed in this company can be an example of environmental accounting principles.

Saudi Basic Industries Corporation (SABIC) is one among the world's top petrochemical industries. The company was established in 1976 with a vision to transform natural gas into valuable petrochemical products. Today, the company is one of

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the largest petrochemical companies in the world, among the world's largest exporters of fertilizer's, polymers, chemicals etc.

The case study analysis revealed that the company is following different methods and process to protect the environmental degradation due to its functioning. SABIC management recognizes that sustainability is one of the most significant issues in the recent times and the challenges are large and solutions are not immediate and short term. Hence SABIC tries to achieve a preferred supplier of material and provided sustainable material to its customers. In the year 2010, it achieved a great milestone in reducing global operational footprint by completing the first comprehensive map of the company's greenhouse gas emissions, energy and water usage across all facilities. The company is provided with various environment, health, safety and security programs like risk analysis and management, training and awareness, regulatory compliance, reporting of incidents, audit and performance monitoring, environmental & industrial hygiene etc to promote and educate employees on environmental and health and safety standards. The company has established effective crisis management systems to mitigate any crisis situation. The company organized workshops to promote clean development mechanism projects at different sites.

The above activities at company level will help to improve the environmental accounting standards in other companies.

Chapter V – Discussion

Environmental Accounting Filing System: Governments around the world are conscious of providing sustainable development in order to prevent the environmental degradation.

There are many environmental, social and economic indicators being developed to help the governments to assess the sustainability of their environment (Heba & Yousef, p-7). The accounting system should have a standardized framework which will capture environmental and resources losses and linkages to other traditional economic indicators. This can be achieved through mandatory environmental filing system to capture all the relevant information regarding the environmental implications.

- i) ***The Contents of Filing System:*** Every company should provide detailed information to the authorities on the proposed activity in the short and long term and the impact of those activities to the local community etc. This report should capture the usage of raw materials, water, energy needs for the current and future expansions. It should provide details of the solid and liquid wastes and the impact to environment and the recycling methods etc. Finally the report will also capture the company's responses to the environmental impact it creates due to the operation.
- ii) ***Reporting of Material, Land and Waste:*** Few resources are limited in supply and irreplaceable in nature. The reuse of secondary material will reduce the degradation. The shared resources will save a lot of energy when it is recycled.
- iii) ***Reporting based on Energy:*** Energy sources cannot be reused or recycled and hence the reporting of energy resources is vital importance for its sustainability (Heba & Yousef, p-12). The economic growth of the country mainly depends on the availability of energy resources. The

reporting should include the renewable and non-renewable sources and its availability, utilization and the future needs etc.

- iv) ***Reporting based on Pollution:*** As the economic development increase it creates more stress on the environment also. Reporting of the impact created by the growth and development in the country is important for managing the risk and sustain the growth. Companies should provide sufficient information to its stakeholders in order to create awareness. The transparent way of reporting the pollution and its impacts will help to develop risk management solutions by the countries.

Sustainable Adaptation to Climate Change: There are some developments happening around the world on the impact of environmental degradation. However there are little knowledge or awareness on the sustainable climate change and the contribution to the wellbeing of humans. Initially it was considered as the reduction in emissions will lead to sustainable solution. However the recent learning emphasized the need to analyze how we adapt to those climate changes. Sustainable adaptation is possible only when the organizations are flexible to change according to the climate changes and reduce greenhouse gas emissions (Erikson et al., 2011, p-3). This approach helps to shift focus on the causes of the climate change and provide comprehensive solution to the problem. Policies on forest land protection and building a hydroelectric dam regularize the flooding and also it can improve ground water level and prevent salt water penetration etc. On the other side it can create problems to the wildlife and flora in the catchment areas. A successful adaptation policy should manage the risks of both issues and still provide better environment to the community (Erikson et al., 2011, p-4). Adaptation

policies must have close coordination between the local strategies and practices as this will enable to produce better results. This phenomenon can be understood from the practice of cultivating indigenous plants in the dry lands to tackle the drought issue. Sustainable adaptation is in effect a global issue as it is dealing with social equality and environmental integrity. Hence people in every sphere must understand and support the actions in order to create a sustainable adaptation to meet the challenges of the changing climate.

Renewable Energy and Climate Change: The Arab region particularly Saudi Arabia is providing ample oil and natural gas to the entire world. It is well positioned with wide exposure to wind and sunlight which contains endless opportunity for renewable energy (Mohamed 2008, p-10). However the country is having capacity to provide only 0.1% energy supply form wind and sun light. The region is slowly developing renewable energy and which results in lesser impact on environment. Some of the current units using renewable energy are desalination plant, solar cooking, air conditioning etc. This source is not creating big impact on the environment and low cost source to produce the required energy.

Carbon and Cost benefit: Global warming is considered to be the center of all discussion on the environmental accounting. There are many innovative ways of accounting the cost of global warming in the modern days of industrialization. Facilitate the company if it can reduce the emissions at low cost and sell those savings to other companies where they would need those additional carbon cost. This approach will help and support the seller and the buyer to control the cost of emissions. As per Kyoto Protocol company can sell the carbon credit to the other companies in order to manage the higher requirement of

carbon emissions. This will facilitate the companies to reduce the emissions by way of efficient use of energy resources, constructing hydroelectric dams in place of coal fired or fossil fuel projects, wind farms generating green electricity, biofuel plantations, tree plantations etc (Lohmann 2009, p-506).

In spite of all the efforts on saving energy and reducing the emissions, there is still work going on with various agencies on creating consistent and standardized methodologies for the calculation of the real cost saved by various important projects. However, these efforts lead to create innovation on the ways and means of reducing emissions and creating alternatives for greenhouse gas effects (Lohmann 2009, p-508).

The carbon accounting and the analysis of cost and benefit are parallel in certain ways. These are very ambitious to work on understanding the carbon cost in an environment with many inequalities. It requires further expertise and analysis to assess the cost of carbon and its implications on our environment. The carbon accounting and cost benefit analysis are two different dimensions (Lohmann 2009, p-529) in the environmental accounting and it will develop a new market frame where the conventional differences may not be present. Carbon trading will facilitate the companies and countries to concentrate more on the welfare of the people while implementing new projects and develop new set of targets on the conservation of the environment.

Community Based Risk Management: The concept of community based risk mitigation started in the year 1984 at the International Conference on Disaster Mitigation program Implementation (Maskrey 2011, p-42). It was one of the first to discuss the issue very structurally and estimated the need to involve the local community to manage the risk at the time of any disaster. The involvement of local community on preparedness and

awareness on the disaster will lead to better response at the time of need though the investment is very little. The community based risk management is more relevant in developing countries like Saudi Arabia where the changes in the climate and environment will magnify the existing risks. Many reports indicate that a lot of community based risk management initiatives are growing and it even caters to the need of addressing the vulnerability and livelihood after disaster (Maskrey 2011, p-50). These programs are more successful when it is involved with other NGOs, governments, other supra-local stakeholders (Maskrey 2011, p-50).

The above success on the risk management was possible to achieve due to the decentralization of the process where the local governments with better resource and expertise involved. It was also observed that if the governments are weak and not active in risk mitigation process through local communities, then the success is also low since there was no proper coordination and absence of political conviction etc (Maskrey 2011, p-51). Such partnerships will create an enabling government with high accountability and competency and support from strong civil society. These partnerships can be nurtured further though political, social and economic support from national and international institutions.

Progress in natural hazard risk reduction: Most countries exposed to natural hazard may not have the ability to manage the issues of natural hazards without assistance from outside of the country (Bender 2011, p-71). International Humanitarian relief organization is involved widely on disaster recovery and reconstruction programs throughout world (Bender 2011, p-71). These organizations might not be able to support extensively if the rate of disaster is increasing due to various factors of climate change

and fatigue of the donors. There is a higher need to provide assistance in times of emergency situations like natural disaster. Disaster risk management will work towards reducing the occurrence of hazards and reduce the damage during any hazards situation. However the emergency management team looks after the immediate needs of the people at the time of any disaster. This approach will reduce the overlapping of these two activities and enable the teams to focus on the specific job and produce better results (Bender 2011, p-73).

The current vulnerability to climate change due to the impact of development initiatives will continue to grow in the future. The development initiatives cannot be stopped due to the impact on climate change. Hence the developmental initiatives should contain mitigation actions in order to reduce the impact on the environment (Bender 2011, p-73). The risk management actions should be framed by the government and the actions should consider all the risks associated with the disaster. There should be a national and state level risk reduction measures with clear objectives and goals to manage the climate change adaptation and risk reduction (Bender 2011, p-77).

All the risk management and climate change adaptation initiatives must be included in the developmental plans. The information relating to natural hazard and the vulnerable areas must be shared among the public in order to access and benefit from the information. Risk reduction plans must consider the communities affected immediately and also the possible impacts on the neighboring communities.

Recommendations for Improving Environmental Accounting: Saudi Arabia is one of the member countries of Economic and Social Commission for Western Asia (ESCWA). This study recommends the following actions to improve the environmental accounting

of resources particularly water and energy. Saudi Arabia's national statistics offices should make it mandatory to record and update all water resources in the country. The local bodies should make it as a regular practice to update and cooperate with the national bodies to support data related to water and energy resources. The second step is to coordinate with all other institutions like different departments and municipalities in the country to record data relating to the resources and get this information for data analysis. Create statistical coordinating committees for collection and dissemination of data to all environmental bodies for effective implementation.

All these institutional structure will function only when it is supported with sufficient human resources. Hence the committees should be supported with staff and financial resources with appropriate training to handle issues, conduct surveys and analysis. Next step is to set up monitoring stations and collect data and conduct surveys through these stations. Communicate the data to various professional bodies to carry out further studies to improve the resources and utilize the available resources effectively in order to preserve the environment. These actions are comprehensive and intended to be utilized further for preservations and improvement of the available resources. This system will create a strong environmental account in Saudi Arabia.

Steps Taken in the Ninth Plan 2010 – 14: Saudi Arabia has realized the importance of protecting its environment and taken many concrete steps through it five years plans. The ninth five year plan contains the following actions.

1. Enhance preventive mechanism to protect the environment through conservation and closely monitoring the performance indicators of the environment.

2. Develop specialist and experts in environmental protection and provide training and awareness to the stakeholders and people.
3. Create close cooperation between metrology and environmental protection and other related groups to improve the environmental protection initiatives.
4. Cope up with the increased demand for urbanization and industrialization within the scope of sustainable development.
5. Facilitating more accurate data on environmental monitoring and forecast and reduce the risk of natural hazards.

All the above steps would have huge impact on the government policies and procedures and transformed into actions in order to protect the environmental resources in the country.

Towards robust global greenhouse gas monitoring system: It is understood from various reports that the scientific and technical infrastructure available in the country is not sufficient to monitor (GEO, 2010 & NRC, 2010b) the greenhouse gas emissions. However the existing facility will be able to capture estimates about the greenhouse gas emissions to certain extend. The current CO₂ emission policies are restricted with individual facilities are the national level (Duren & Miller 2011, p-81). A facility to measure the surface level and satellite observations will gain further deeper input on gas emissions from different locations in the world. An integrated and improved satellite and aircraft remote sensing measurement system will provide information on the emissions. The data provided by this system should be accurate to enable the decision makers to decide the right corrective measures to control the greenhouse emissions. The information from the system should be made available on time and continuously without

interruptions (Duren & Miller 2011, p-83). There is a higher need to apply an improved top-down method in analyzing and bottom-up method to check the monitoring of greenhouse gases in the earth.

If these systems are implemented in Saudi Arabia the greenhouse gas emissions can be measured accurately and effective counter measures can be implemented by the authorities. Also these data can be shared with the private and other institutions for effective monitoring and controlling of greenhouse gas emissions from Saudi Arabia.

Chapter VI – Conclusion: Global warming is one of the major issues among the professionals in the world. If there is no attempts initiated today to save the environment from the ill-effects of global warming then the generations of tomorrow may not be able to enjoy the gift of nature. Environmental accounting is one of the important steps to monitor and regulate the development and provide sustainable methods for preserving the natural resources today. Since this subject is fairly new and evolving there are still issues around the practical aspect of it. However the study explains different innovative ways to manage the issues around the subject and still facilitate for the better accounting of the environment with a view to provide sustainable growth to everyone.

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