INCOME TAX INCENTIVES FOR RENEWABLE ENERGY RESEARCH AND DEVELOPMENT AND IMPLEMENTATION: A COMPARISON BETWEEN SOUTH AFRICA AND CHINA

by

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Submitted in partial fulfilment of the requirements for the degree

Magister Commercii in Taxation

in the

FACULTY OF ECONOMIC AND MANAGEMENT SCIENCES

at the

UNIVERSITY OF PRETORIA

STUDY LEADER : Mrs W Janse van Rensburg

Date of submission:

2013-11-11

ABSTRACT

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DEGREE: MAGISTER COMMERCII

Like many fossil fuel dependant countries, South Africa faces the dual problem of responding to an increasing demand for coal production to satisfy rising energy requirements, while at the same time responding to the call to reduce greenhouse gas emissions. The exploration of renewable energy sources as an alternative to fossil fuels has therefore become an increasingly pressing concern in South Africa.

South Africa has significant renewable energy potential which can simultaneously address both energy needs and the environmental concerns arising from greenhouse gas emissions. A tax incentive regime is a popular governmental policy instrument that has the potential to advance technologies and stimulate markets by encouraging research and development as well as the implementation of renewable energy technologies. It is therefore important to determine how the tax incentives currently available in South Africa for research and development and the implementation of renewable energy technologies, compare with those adopted internationally.

China was identified as a country that offers generous fiscal incentives to encourage research and development and the implementation of technology such as renewable energy technologies. The objective of this study was to determine how the income tax incentives for research and development and the implementation of renewable energy technologies currently available in South Africa compare with the income tax incentives available in China for the same purpose. This was achieved by means of a head-to-head comparison of the impact that the two tax regimes would have in a hypothetical case study

Keywords:

Renewable energy

Research and development

R&D

Implementation

Fiscal policy

Tax incentives

China

OPSOMMING

Soortgelyk aan baie lande wat van fossielbrandstof afhanklik is, word Suid-Afrika gekonfronteer met ’n tweesydige probleem, naamlik hoe om aan die toenemende vraag na steenkool te voorsien ten einde stygende energiebehoeftes te bevredig en terselfdertyd te reageer op die noodsaaklikheid om kweekhuisgasse te verminder. Navorsing rondom hernubare energiebronne as 'n alternatief vir fossielbrandstowwe is en word al hoe meer relevant en dringend.

Suid-Afrika het aansienlike hernubare energiepotensieel wat gelyktydig energiebehoeftes sowel as omgewingskwessies rondom die uitwerking van koolsuurgas op die omgewing kan aanspreek. ’n Beleidsisteem wat belastingaansporings aanmoedig is 'n gewilde instrument wat deur owerhede gebruik word ten einde tegnologiese vooruitgang te bevorder en markte te stimuleer. Dit word bereik deur die gebruik van voorsiening van belastingaansporings vir navorsing en ontwikkeling, asook vir die implementering van hernubare energietegnologieë. Dit is derhalwe belangrik om te bepaal hoe die belastingaansporings wat huidig in Suid-Afrika beskikbaar is vir navorsing en ontwikkeling en die implementering van hernubare energietegnologieë, vergelyk met internasionaal aanvaarde belastingaansporings.

China is geïdentifiseer as ’n land wat mildelike fiskale aansporings bied ten einde navorsing en ontwikkeling en die implementering van hernubare energietegnologieë aan te moedig. Die doel van die studie was, om deur middel van ’n hipotetiese gevallestudie, te bepaal hoe die inkomstebelastingaansporings wat in Suid-Afrika beskikbaar is, vergelyk met die aansporings in China.

Kernwoorde:

Hernubare energie

Navorsing en ontwikkeling

Implementering

Fiskale beleid

Belastingaansporings

China

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INCOME TAX INCENTIVES FOR RENEWABLE ENERGY RESEARCH AND DEVELOPMENT AND IMPLEMENTATION: A COMPARISON BETWEEN SOUTH AFRICA AND CHINA

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The world's climate is changing, and most climate scientists agree that the increased level of greenhouse gases in the earth's atmosphere is a major cause of the change. Due to the release of carbon dioxide and other gases in the atmosphere by energy generation processes, the excessive use of fossil fuels such as coal is considered to be the main driver behind global warming and climate change. (Salim & Rafiq, 2011:1051.)

Historically, South Africa has been largely dependent on fossil fuels as a source of energy, with approximately 70% of the total energy supply derived from coal. This over-dependence on coal has led to an increasingly high level of carbon dioxide emissions relative to the size of the South African economy and population. The coal-burning sector alone accounts for 87% of carbon dioxide emissions. (Menyah & Wolde-Rufael, 2010:1374.)

South Africa, like many other fossil fuel dependant countries, is currently faced with the dual challenge of producing more coal to satisfy energy requirements, while at the same time having to contend with the need to reduce greenhouse gas emissions (Krupa and Burch, 2011:6258). According to Krupa and Burch (2011:6258), "South Africa's current power structure has resulted in inequality and economic injustices as wealth and power while also contributing to significant environmental degradation." More attention has thus been drawn to furthering the exploration of alternatives to fossil fuel, such as renewable energy sources (Krupa and Burch, 2011:6258).

There are a variety of benefits, or *opportunity areas* as they are known, associated with the implementation of renewable energy technology. In developing countries energy is a vital tool to stimulate production, income generation and social development. Developed countries, on the other hand, are more concerned with identifying alternative energy solutions to mitigate climate change, ensure energy supply security and stimulate the creation of employment. (IPPC, 2011:191.)

Renewable energy technologies have the potential to address numerous environmental, social and economic developmental problems, in addition to adaptation to climate change (IPPC, 2011:191). According to the IPCC (2011:191), the four most significant opportunities associated with the implementation of renewable energy technologies are social and economic development, energy access, energy security, and climate change mitigation.

There are a number of viable renewable energy sources in South Africa and these have the capacity to simultaneously address both the energy needs and the environmental concerns associated with carbon dioxide emissions. However, far too few renewable energy projects for electricity generation have been deployed under the current renewable energy policies implemented in South Africa. (Edkins, Marquard & Winkler, 2010:ii.)

Governmental policies have the potential to advance technologies and stimulate markets, and it is therefore important for governments to consider the implementation of policies to encourage renewable energy research and development and the implementation of renewable energy technologies (IPCC, 2011:191). Policy tools available to governmental policy-makers include tax based options – a country's tax system can be utilised in a variety of ways in order to achieve its renewable energy goals (OECD, 2010:111). It is therefore important to determine what income tax incentives are currently available in South Africa for renewable energy research and development and the implementation of renewable energy technologies, and how these incentives compare with those implemented in other countries.

A number of countries are currently meeting the challenge of the transition to a resource efficient economy. A study by Ernst and Young found that the People's Republic of China currently has one of the most attractive renewable energy markets. (Ernst & Young, 2012:21.) In addition, China offers generous fiscal incentives to encourage renewable energy research and development and the implementation of renewable energy technologies (Chan & Cheung, 2010:58). Furthermore, both South Africa and China form part of BRICS (Brazil, Russia, India, China and South Africa), a group of nations characterised by their emerging and rapidly-growing economies (PwC, 2012:2). It is on this basis that it was determined that China is a suitable country for purposes of comparison.

1.2 PROBLEM STATEMENT

The excessive use of fossil fuels such as coal is considered to be the main driver of global warming and climate change (Salim & Rafiq, 2011:1051). Like many fossil fuel dependant countries, South Africa is currently faced with the dual problem of producing more coal to satisfy energy requirements, while at the same time dealing with the challenge of reducing greenhouse gas emissions (Burch & Krupa, 2011:6258). Apart from their limited availability and detrimental effect on the climate, the combustion of fossil fuels has a number of additional negative environmental consequences. Renewable energy technologies, however, have the potential to address multiple environmental, social and economic developmental problems, in addition to adaptation to climate change. (IPPC, 2011:191.)

South Africa is endowed with sources of renewable energy that can simultaneously address both energy needs and the environmental concerns arising from carbon dioxide emissions. However, under existing renewable energy policies, few renewable energy projects for electricity generation have been deployed. (Edkins, Marquard & Winkler, 2010:ii.) The question then arises how existing renewable energy policies can be improved in order to encourage renewable energy projects. Fiscal policies, such as tax incentives, are utilised by governments in a variety of ways in order to achieve their renewable energy goals.

An extensive database search undertaken for this study indicated that there have been few studies of the differences between the income tax incentives available in South Africa and those available in other countries in respect of renewable energy research and development and implementation of renewable energy technology.

It was determined that China is a suitable country for purposes of comparison. A comparison will therefore be made between the income tax incentives available in South Africa for renewable energy research and development and the implementation of renewable energy technologies, and the incentives available in China for the same purpose.

1.3 PURPOSE STATEMENT

The international comparison will identify and discuss differences identified between South Africa and China, and possible improvements to the current South African legislation, with the focus on the ability of the legislation to encourage renewable energy research and development and the implementation of technology flowing from the research and development. It is intended that the international comparison will highlight possible lessons that could be learnt from China.

The aim of this study is therefore to narrow the knowledge gap that has been identified between current South African practice and the best international practice, by determining how the income tax incentives in South Africa for renewable energy research and development, and for the implementation of renewable energy technologies, compare with the income tax incentives available in China for that purpose.

1.4 RESEARCH OBJECTIVES

- To provide a general understanding and overview of the importance of renewable energy technology and the governmental policies that have the potential to advance renewable energy technologies and stimulate markets.

- To analyse and critically evaluate the income tax incentives for renewable energy **research** and **development** and the **implementation** of renewable energy technologies available in South Africa and China respectively.
- To compare income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa and China in order to expose any differences and make relevant recommendations as to what South Africa can learn from China.

1.5 IMPORTANCE AND BENEFITS OF THE PROPOSED STUDY

This study will make a unique contribution to the development of a forward-looking taxation policy by identifying and investigating differences in the income tax incentives available for research and development, and for the implementation of renewable energy technologies in South Africa and China respectively. The possible improvements identified in this study could be used by the legislator to improve current legislation in order to assist in achieving government's renewable energy goals.

It is also intended that the findings should assist taxpayers in determining what incentives are available should they wish to engage in research and development in the field of renewable energy technologies in South Africa, or in the implementation of technologies emerging from the research and development.

1.6 DELIMITATIONS

The proposed study has several delimitations relating to the context, constructs and theoretical perspectives of the study. Firstly, it will be limited to the discussion of the use of income tax incentives in the context of renewable energy policies that are available to governmental policy makers, with the focus on research and development and implementation income tax incentives in particular. Accordingly, the study will not consider the specifics of policy design but will focus on the concepts of the incentives. In addition, this study will focus on the corporate income tax incentives available to taxpayers for the defined purpose, and will exclude the discussion of any potential additional tax regimes imposed by the relevant legislative authorities. This study will focus on exposing the differences between the South African and Chinese income tax incentives, and will not address the viability in a South African context of the Chinese income tax incentives and governmental policies identified. The study is performed with specific reference to the geographic context of South Africa and China. Finally, the study will focus only on the income tax incentives from the perspective of the taxpayer, as a mechanism to reduce the taxpayer's income tax liability.

The case study provided in chapter 5 does not address the political, economic and policy aspects of the implementation of the income tax incentives or any other aspect other than the pure application of the current corporate tax law in South Africa and China.

1.7 ASSUMPTIONS

For the purposes of this study it is assumed that a pure literature review is an appropriate means of investigating the proposed topic. It is assumed that tax incentives do help spur spending and investment on renewable energy research and development and implementation of renewable energy technologies. It is further assumed that the Chinese tax incentives and governmental policies identified are viable in a South African context. For the purpose of this study, it is assumed that research and development relates to the innovation stage of the renewable technology cycle while implementation relates to the actual deployment of the renewable energy technologies, and that these stages can be viewed in isolation.

For the purposes of the case study that is performed in chapter 5, it is assumed that the case study is based on a hypothetical scenario and is in accordance with the generally accepted rules of calculating income tax in terms of the Income Tax Act (58/1962) and the Chinese corporate income tax laws.

1.8 DEFINITION OF KEY TERMS

This study involves a number of key concepts which are defined below:

Affected asset: "An asset such as any line or cable used for the transmission of electricity, including any earthworks or supporting structures forming part of the line or cable installation" (Stiglingh *et al*, 2013:251).

Allowance: "Tax-free amount subtracted from income to arrive at taxable income" (business dictionary.com, 2013).

Arm's length: "Transactions between affiliated firms which are made purely on commercial basis both firms trying to maximise their advantage, and neither firm accommodating or favouring the other in any way" (business dictionary.com, 2013).

*China New Law: "*Refers to China's 'New Enterprise Income Tax Law' (PRC, 2007), a major departure from the previous tax system. Unlike the old system, with its differentiation between domestic and foreign-owned enterprises and separate tax preference policies, the new tax law unifies taxes and tax rates for foreign and domestic enterprises" (Go, undated).

Deduction: "Business expenses or losses which are legally permitted to be subtracted from the gross revenue of a firm in computing its taxable income" (business dictionary.com, 2013).

Expenditure: "Payment of cash or cash-equivalent for goods or services, or a charge against available funds in settlement of an obligation as evidenced by an invoice, receipt, voucher, or other such document" (business dictionary.com, 2013).

Incentive: "Inducement or supplemental reward that serves as a motivational device for a desired action or behaviour" (business dictionary.com, 2013).

Fossil fuel: "Ancient organic remains (fossils) in sediments which over eons became sedimentary rock, giving rise to solid, liquid, and gaseous fuels such as coal, crude oil, and natural gas. Coal is derived from vegetable matter altered by pressure, whereas crude oil and natural gas are derived from animal and vegetable matter altered by pressure and heat. Essentially, all fossil fuels are highly concentrated forms of far-ancient sunlight trapped in organic cells. They are the primary energy source for human societies since the industrial revolution (mid-19th century to early 20th century), are non-renewable, and also a primary source of global warming" (business dictionary.com, 2013).

Global warming: "Steady increase in the Earth's average lower atmosphere (near surface) temperature due to emissions and build-up of greenhouse gases. While this temperature has risen by 0.6°C in the last 140 years, it may rise from 1.5°C to over 2.0°C by the year 2070, and could completely alter climate zone patterns resulting in increased or decreased rainfall, winds, snow, and other unprecedented weather phenomena. The rising temperature could melt the polar ice caps and cause sea levels to rise everywhere, permanently flooding many low lying parts of the earth. The temperate areas in Asia and Americas might experience crop failures due to drier and hotter conditions" (business dictionary.com, undated).

Greenhouse gas: *"*Any of various gaseous compounds … that absorb infrared radiation, trap heat in the atmosphere, and contribute to the greenhouse effect" (Merriam-Webster, undated).

*Photovoltaic: "*Capable of producing a voltage when exposed to radiant energy, especially light" (business dictionary.com, 2013).

Renewable energy: "Derived from resources that are naturally regenerative or are practically inexhaustible, such as biomass, heat (geothermal, solar, thermal gradient), moving water (hydro, tidal, and wave power), and wind energy. Municipal waste may also be considered a source of renewable (thermal) energy" (business dictionary.com, 2013).

Research and development ('R&D'): "Systematic activity combining both basic and applied research, and aimed at discovering solutions to problems or creating new goods and knowledge'" (business dictionary.com, 2013).

The following table lists the abbreviations used in this document.

Table 1: Abbreviations used in this document

Abbreviation	Meaning
CIT	Corporate income tax rate
CDM	Clean development mechanism (Kyoto Protocol)
CO_2	Carbon dioxide
DST	Department of Science and Technology (South Africa)
ESCO	Energy service company
EMC	Energy management contract
EPC	Energy performance contract
GHG	Greenhouse gas
GWh	Gigawatt-hour
HNTE	High and new technology enterprise *also*: High-new technology enterprise
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer Procurement Programme
KWh	Kilowatt-hour
OECD	Organisation for Economic Co-operation and Development
NERSA	National Energy Regulator South Africa
PPA	Private purchase agreement
IPP	Independent Power Producer Procurement Programme (IPP).
R&D	Research and development
RMB	Renminbi (currency of People's Republic of China)
SAT	State Administration of Taxation in the People's Republic of China
UNFCCC	United Nations Framework Convention on Climate Change
The Act	The Income Tax Act no 58 of 1962

1.9 RESEARCH DESIGN AND METHODS

This study is a non-empirical study, which will be based on a review of existing literature. Saunders, Lewis and Thornhill (2007:595) define a literature review as a "detailed and justified analysis and commentary of the merits and faults of the literature within a chosen area, which demonstrates familiarity with what is already known about the research topic".

The current South African and Chinese legislation regarding income tax incentives available to taxpayers for renewable technology research and development, and the implementation of renewable technology, will be critically evaluated. A comparative analysis will then be undertaken to critically compare the legislation by means of a hypothetical case study in order to highlight any differences, benefits and limitations in South Africa's current income tax incentive legislation as compared to Chinese legislation. Finally, the findings will be summarised in a conclusion and relevant recommendations will be made to highlight what South Africa can learn from China.

1.10 OVERVIEW OF CHAPTERS

This study comprises six chapters. Following the introduction, which sets the context of the study in chapter 1, chapter 2 will provide an understanding of renewable energy technologies, the importance thereof and the policies available to governments to encourage renewable energy research and development and the implementation of renewable energy technology.

Chapter 3 comprises a detailed analysis of income tax incentives for renewable energy research and development and implementation of renewable energy technology, specifically in South Africa. This is then followed by Chapter 4 which provides a detailed analysis of similar incentives in China.

The purpose of chapter 5 is to critically analyse and compare the income tax incentives available in South Africa and China as identified in chapters 3 and 4 respectively. This is achieved by providing a head-to-head comparison of the income tax incentives identified, followed by a hypothetical case study to illustrate the impact of certain of the incentives.

Chapter 6 concludes the study with an assessment of how the study has achieved the proposed research objectives and considers suggestions in respect of possibilities for future research.

CHAPTER 2

IMPORTANCE OF RENEWABLE ENERGY TECHNOLOGY AND GOVERNMENTAL POLICIES

2.1. INTRODUCTION

This chapter will provide a general understanding of renewable energy technologies, the importance thereof and the policies available to governments globally to encourage research and development in the field, and the implementation of renewable energy technologies that become available.

2.2. RENEWABLE ENERGY TECHNOLOGY

Renewable energy is a general term which encompasses a variety of technologies derived from naturally replenished sources that can satisfy multiple energy service needs by the production of electricity, thermal energy and mechanical energy, as well as fuels (IPCC, 2011:191).

Certain of these renewable energy technologies can be deployed locally in rural environments, while others are typically deployed in large energy networks in urban environments. The extent to which renewable energy technologies are developed and implemented varies, with some being technically mature while others are in an earlier phase of technical maturity and commercial deployment, or fill specialised niche markets. (IPCC, 2011:191.) Examples of renewable energy technologies are discussed in the table below.

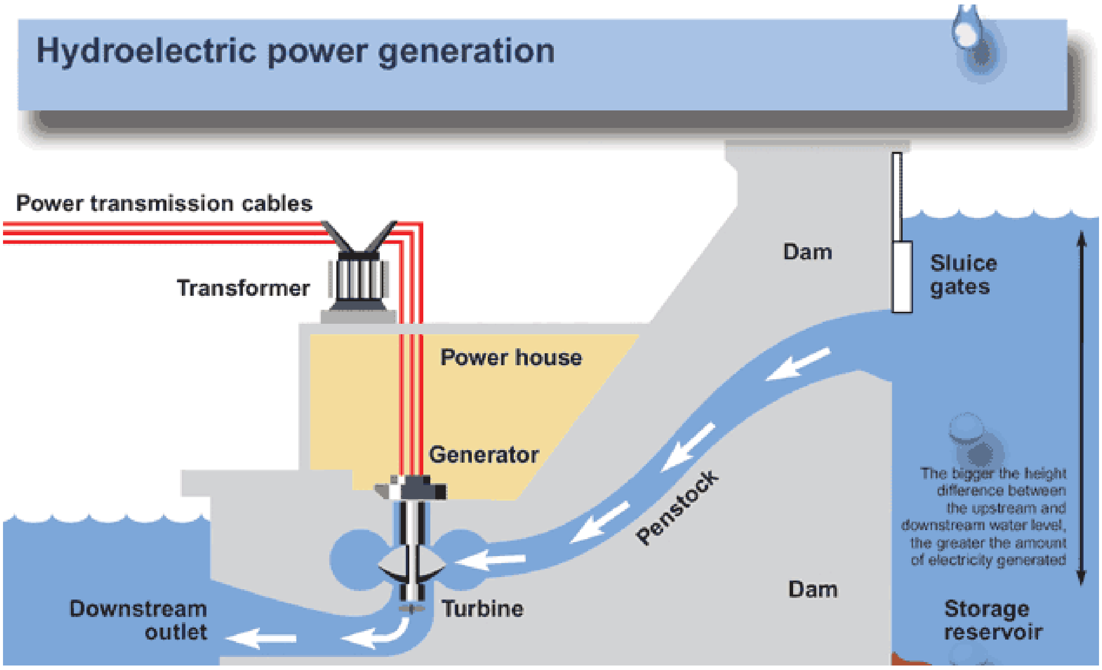
Table 2: Renewable energy sources and technologies

Renewable energy technology	Description
Bioenergy	Bioenergy can be produced by various processes that use feedstocks to produce energy such as electricity and heat. The feedstocks used for this purpose include biomass from forest, agricultural and livestock residues; short-rotation forest plantations; energy crops; the organic component of municipal solid waste; and other organic waste streams.
Direct solar energy	The principal behind direct solar energy is to harness the energy emitted by the sun in order to produce electricity. Materials that are capable of producing an energy voltage when exposed to radiant energy, especially light, known as *photovoltaics*, are used to harness and then produce thermal energy (heating or cooling).
Geothermal energy	Accessible thermal energy from the Earth's interior is harnessed to produce energy. Heat is extracted from this thermal energy and then stored in geothermal reservoirs using wells or other means. Heat is stored in underground reservoirs of porous rock containing hot water, known as *hydrothermal reservoirs*, that provide sufficient natural heat. Natural reservoirs that do not produce sufficient heat and are improved by means of hydraulic stimulation, are called *enhanced geothermal systems*. Once fluids of various temperatures reach the surface, they are used to generate electricity or, more directly, for applications that require thermal energy, such as heating. Lower-temperature heat from shallow wells are used for geothermal heat pumps in heating or cooling applications.
Hydropower	Hydropower technologies harness the kinetic gravitational energy driving the movement of water from higher to lower elevations. These technologies are used primarily to generate electricity. See figure 1 below. Hydropower projects include dam projects with reservoirs, run-of-river and in-stream projects. Due to the variety of sources available, hydropower has the potential to meet large urban needs as well as rural needs on a smaller scale.

Renewable energy technology	Description
Ocean energy	Ocean energy technologies rely on the potential, kinetic, thermal and chemical energy of ocean water. These energies can be transformed in order to produce electricity, thermal energy, or potable water.
Wind energy	Wind energy technologies harness kinetic energy from movements in the air. According to the IPCC (2011:9), the primary application of wind energy is to produce electricity from large wind turbines located on land (onshore) or in sea- or freshwater (offshore).

Source: Adapted from IPCC (2011:8,9)

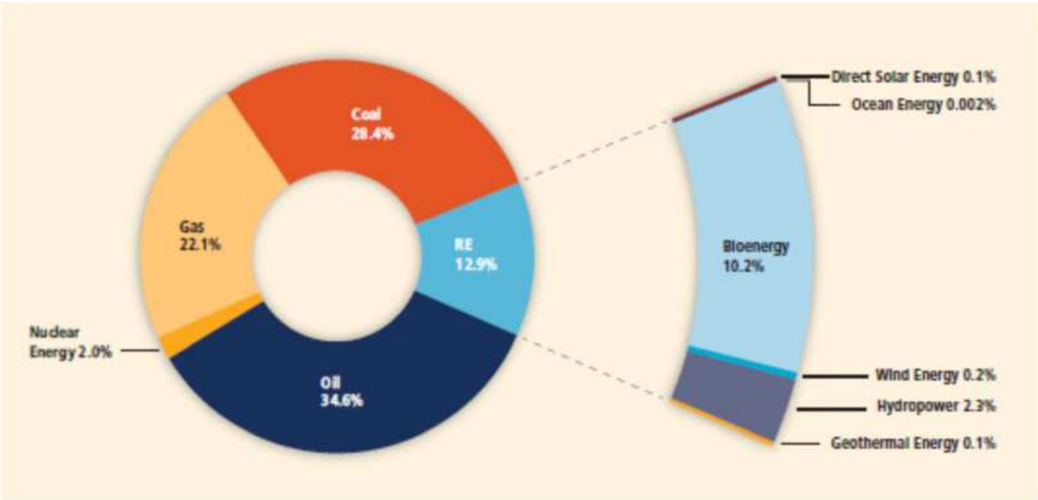
Figure 1: Hydroelectric power generation



Source: USGS (2013)

The IPCC estimates that renewable energy accounted for only 12.9% of the total global primary energy supply in 2008. In addition, it was found that renewable energy contributed only approximately 19% of global electricity supply (16% hydropower, 3% other renewable energy sources). The contribution of renewable energy technologies to total global energy production as discussed above is depicted in figure two below. (IPCC, 2011:9.)

Figure 2: Global contribution of renewable energy technologies



Source: IPCC (2011:10)

2.3. BENEFITS OF RENEWABLE ENERGY

There are a variety of benefits, or 'opportunity areas' as they are known, associated with the implementation of renewable energy technology. In developing countries, energy is a vital tool to stimulate production, income generation and social development. Developed countries, on the other hand, are more concerned with identifying alternative energy solutions to mitigate climate change, address energy supply concerns and stimulate the creation of employment. (IPPC, 2011:191.)

Renewable energy technologies have the capacity to address multiple environmental, social and economic developmental concerns, including adaptation to climate change (IPPC, 2011:191). According to the IPCC, the four most significant opportunities associated with the implementation of renewable energy technologies are social and economic development, energy access, energy security, and climate change mitigation (IPPC, 2011:191). These benefits are discussed in detail below.

2.3.1. Social and economic development

The IPCC (2011:191) are of the view that one of the most relevant factors that influence increasing energy consumption is economic growth. The expansion and diversification of global economic activity has led to the demand for more sophisticated and flexible energy sources. This demand has therefore been associated with the shift away from the simplified method of direct fuel combustion towards energy, which is of a higher quality. (IPCC, 2011: 191.)

It was found that access to clean and reliable energy is an important factor for human development, which contributes to economic activity, income generation, poverty alleviation, and improvements in healthcare and education (IPCC, 2011: 191).

2.3.2. Access to energy

Inadequate access to energy, especially electricity, can place serious obstacles in the way of development, and result in growing poverty and an outward migration of people to large urban areas, as well as increasingly negative expectations in the community about its future (Kaygusuz, 2011:937).

Kaygusuz (2011:937) is of the view that access to electricity can provide such societies with a higher degree of economic sustainability and a better quality of life. In 2009, more than 1,4 billion people globally lacked access to electricity, with 85% of these people located in rural areas (IPCC, 2011:191). There are various initiatives – some of which are based on renewable energy technology, particularly in developing countries – that are aimed at improving access to electricity (IPCC, 2011:191).

Small and standalone renewable energy structures have the potential to address rural communities' energy needs in a more cost-effective manner than fossil fuel alternatives such as diesel generators. For example, solar energy structures are a practical and cost-effective means of generating electric power to provide basic services, such as lighting and access to clean drinking water in rural areas. (IPCC, 2011:191.)

The lack of access to electricity is, however, not the only problem that faces rural communities. Clean fuels for cooking and general household use are also in short supply. (Kaygusuz, 2011:937.) Without access to modern energy sources, rural communities are largely dependent on the use of traditional biomass sources such as wood, charcoal and animal waste for cooking and heating, which increases their exposure to pollutants, and in turn increases the risk of contracting respiratory and lung diseases. Modern bioenergy technologies include liquid propane gas stoves, renewable energy-based biomass stoves and biogas systems that offer a safer alternative to these potentially harmful traditional biomass sources. (IPCC, 2011:191.)

2.3.3. Energy security

According to the IPCC (2011:191), "energy security can best be understood as robustness against (sudden) disruptions of energy supply. More specifically, availability and distribution of resources, as well as variability and reliability of energy supply can be identified as the two main themes".

Energy insecurity together with the ever increasing price of conventional energy sources are significant threats to economic and political stability. Energy supplies are currently dominated by fossil fuels. Uncertainty regarding the availability, and the price volatility, of these fuels have significant economic impacts and have been a major driver behind the demand for renewable energy. Renewable energy technologies contribute to energy security through the diversification of energy supplies and reduction of the dependence on limited resources. (IPCC, 2011:191.)

2.3.4. Climate change mitigation and reduction of environmental and health impacts

Climate change mitigation is one of the key drivers behind the growing demand for renewable energy technologies. Climate is the term used to refer to average weather patterns, and the average climate around the world is referred to as global climate. The term 'global climate change', refers to the global climate and a pattern of change that has occurred. One of the most significant indicators of climate change is the increased temperature of the Earth. This increase in the earth's temperature is referred to as global warming. The world's climate is changing. Most climate scientists agree that the increased level of greenhouse gases in the earth's atmosphere is a major cause of the change. (EPA, 2013.)

The greenhouse effect is a natural occurrence which is essential in keeping the earth's surface warm. Greenhouse gases allow sunlight to enter and then prevent the heat from escaping the atmosphere. The most important greenhouse gases are water vapour (H_20), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_20), halocarbons, and ozone (O_3). These gases occur naturally and are vital to our survival on earth*. (*The National Academies, 2008:3.)

However, human activities such as the burning of fossil fuels, are escalating the concentration of these gases, which has led to the amplification of the natural greenhouse effect. The higher concentration of greenhouse gases in the atmosphere acts as a thickening blanket which in effect traps more infrared energy than occurs naturally thus resulting in a gradual increase in temperature resulting in turn in global warming. *(*The National Academies, 2008:3.)

The expected effects of global warming and climate change include (IPCC, 2007:230):

- rising of sea levels,
- increase in the strength of hurricanes and other storms,
- disruption of the natural life cycles of species,
- increase in the occurrence of floods and droughts,
- impact on global food production, and
- disruption of ecosystems.

Apart from the fact that fossil fuels are being irreversibly depleted, and the detrimental impact of greenhouse gases released by their combustion, there are also health-related concerns about the many pollutants they release when burnt. Exposure to some of these pollutants, either directly or as a result of the urban smog they cause, has been associated with increases in the incidence in circulatory and respiratory diseases and other human health problems. It is, moreover, known that some of these emissions are responsible for acid rain and the resulting acidification of forests, freshwater lakes and even soil. This can harm aquatic life and cause damage to foliage. (Encyclopaedia Britannica, 2013.)

Renewable energy technologies therefore have the potential to assist in the reduction of GHG emissions and address the environmental and health concerns raised above (IPCC,2011:192).

2.4. RENEWABLE ENERGY POLICIES

Apart from reducing GHG emissions, renewable technologies can have a direct impact on the supply of energy to rural areas, and on energy security in general. By creating employment opportunities these technologies have the potential to stimulate job creation and, as a consequence, provide an impetus for social and economic growth and development. (IPCC,2011:192.)

Governmental policies have the potential to advance technologies and stimulate markets and it is therefore important for governments to consider the implementation of policies that will encourage research and development in the field, as well as the implementation of renewal energy technologies that emerge from the research and development (IPCC, 2011:882).

The IPCC organises renewable energy policies into the following simplified categories (IPCC, 2011:883):

- The first is fiscal incentive. These policies provide mechanisms that enable individuals and companies that make a contribution to renewable energy, to reduce certain taxes they are liable for, or to receive financing from the public purse in the form of rebates and grants.
- Secondly, there are policies that make public finance available for the development of renewable energy. This is provided in the form of loans and equity that can generate financial returns for the treasury, and guarantees by which the public purse incurs financial liability.
- In the third place regulations are used to guide and control activities that may have a positive or negative impact on the development and deployment of renewable energy.

It is important to note that when considering renewable energy policies, the IPPC make a distinction between policies that are geared towards research and development of renewable energy technologies and those that focus on deployment of renewable energy technologies. Government policies will therefore be discussed below in the context of the relevant stage of the renewable energy technology life cycle to which they relate. (IPCC, 2011:883.)

2.4.1. Policies to encourage investment in renewable energy research and development

Funding is a vital resource required to stimulate research and development in the field of renewable energy technologies. However, there are a number of barriers to obtaining such funding, which are discussed below. (Pegels, 2010:4948.)

Firstly, because the renewable energy market has not reached maturity yet, it is still volatile and characterised by risk and uncertainty – both of which are economic barriers to the development of renewable energy systems (Pegels, 2010:4948). Financial institutions take this risk into consideration, which raises the cost of lending. Investments in the development of such technologies are therefore unattractive to potential investors due to high interest rates for funding. In addition, uncertainty regarding the capital return on investment can limit the financial support and mechanisms available to fund renewable energy technology projects. This uncertainty and lack of financial support create a major barrier to potential investors in medium to large-scale renewable energy development in South Africa. (Pegels, 2010:4948.)

Secondly, private institutions may be reluctant to take on the risk associated with investing in a new technology that may not ultimately succeed (IPCC, 2011:882). Last, the time period for the technology to reach the deployment phase in the marketplace is significant and may exceed the period acceptable to private investors. Hence, governmental polices play a crucial role in overcoming these barriers to the funding of renewable energy research and development and the implementation of emerging technologies. (IPCC, 2011:882.)

The table below provides a list of policies that are potential sources of funding available for renewable energy research and development, together with their definitions.

Table 2: Renewable energy research and development funding policies

POLICY/FUNDING SOURCE	DEFINITION
FISCAL INCENTIVES	
Academic R&D funding	These are funds granted to academics to nurture and support academic work in a given discipline and thus help to generate new knowledge that can stimulate new applications.
Grant	Grants provide financial support for the development of new ventures when risks are highest and financing and investments therefore difficult to obtain. Such grants can in some instances help to generate funds by bolstering the confidence of potential investors.
Incubation support	The purpose of incubation support funding is to support new ventures by covering operating costs, providing advice on business development and how to go about raising capital, providing market research and creating and guiding management teams.
National and international public research centres	Through what is known as 'open access', companies can gain access to intellectual property by entering into joint agreements with one or several public research and development centres, which will also share some of the cost of developing the innovations and be in a position to endorse the benefits of new technologies.
Public-private partnership	Such partnerships make it possible for organisations to benefit from cross-disciplinary research networks, encompassing a range of organisations in different locations – from universities to industrial organisations – participate. This opens opportunities to explore novel solutions that might normally seem to be too risky. Networking also makes it easier to

	build supply chains and, ultimately, to bring innovative products and processes to maturity.
Prize	Prizes can be accompanied by monetary rewards that enable the winners to pursue research and development work that would otherwise not be possible.
Tax incentives	Reductions in taxes made possible by such incentives, provide organisations with scope to explore possibilities that would otherwise not be considered.
Voucher scheme	This scheme gives companies access to research and development centres.
PUBLIC FINANCE	
Venture capital	Venture financing – on its own or as a component of matching financing – makes possible original research that would otherwise be too risky and expensive.
Soft/convertible loan	This is a financing instrument that is made available in the initial (pre-commercial) stages of research and product development, often in the form of loans repayable only when products or procedures reach the commercialisation stage.

Source: Adapted from IPCC(2011:886)

Successful research and development funding policies can assist in leading technology innovators towards commercialisation and help attract early and later risk capital investment that otherwise would not be available because investors tend to avoid high risk and protracted investment horizons (IPCC, 2011:886).

In addition to governmental policies geared to renewable energy research and development and the implementation of renewable energy technologies, it is important for governments to ensure that they are able to create demand for renewable energy technologies in the marketplace. Governmental policies that have the capacity to stimulate the implementation of renewable energy technologies are therefore discussed below. (IPCC, 2011:886.)

2.4.2. Policies to encourage the implementation of renewable energy technology

There are various renewable energy specific policy options that are aimed at implementation (also referred to as 'deployment'), that have the capacity to create a demand for renewable energy technologies in the market place. (IPCC, 2011:889.) This section will focus primarily on fiscal incentives and public financing tools.

Financial incentives such as those based on investment, taxation concessions, rebates and grants can reduce the costs and risk associated with investment in renewable energy by reducing the upfront investment costs incurred for the installation, and the production costs of the technologies. These incentives compensate for market failures which render renewable energy at a competitive disadvantage, and assist in alleviating the financial burden of investing in renewable energy. (IPCC, 2011:889.)

The provision of public finance is also important to encourage the uptake of renewable energy. Public finance mechanisms have a dual objective, firstly to directly mobilise or leverage commercial investment into renewable energy projects, and secondly to indirectly create scaled-up and commercially sustainable markets for these technologies. (IPCC, 2011:889.)

The table below provides a list of general renewable energy policies for the deployment of renewable energy technologies together with their definitions.

Table 3: Renewable energy deployment policies and funding mechanisms

POLICY	DEFINITION
FINANCIAL INCENTIVES	
Grant	This is financial assistance granted by a government for a specific purpose, that does not have to be repaid.

	Grants and rebates help to alleviate the financial burden associated with preparatory work such as establishing infrastructure and acquiring plant and equipment.
Energy production payment	This is a payment received directly from the government in respect of renewable energy produced.
Rebate	A rebate is a single direct payment made by a government to an organisation to cover a specified percentage or amount of the investment cost required to develop or implement a renewable energy system or service.
Tax incentives	This policy provides an incentive to the investor or owner of qualifying renewable energy technology. It can provide a full or partial deduction from tax obligations or income.
Variable or accelerated depreciation	Depreciation results in a reduction of the tax burden in the first years of operation in respect of renewable energy equipment.
PUBLIC FINANCE	
Investment	Financing provided in return for an equity ownership interest in a renewable energy company or project.
Guarantee	This is a funding mechanism aimed at risk sharing. It provides comfort to commercial banks that extend loans to renewable energy companies and projects that have high perceived credit risk.
Loan	Financing which is provided to a renewable energy company or project in return for a debt (repayment) obligation.
Public procurement	Public entities preferentially purchase renewable energy services and/or renewable equipment.

Source: Adapted from IPCC(2011:890-891)

From the above table it is evident that there are various climate change policies and funding mechanisms available to governmental policy makers to encourage renewable energy research and development and the implementation of renewable energy technologies. For the purposes of this study, the discussion will focus on tax-based polices available for renewable energy research and development, and for the implementation of renewable energy technologies. These tax policies are discussed in detail below.

2.4.3. Tax-based policy instruments to encourage renewable energy research and development and the implementation of renewable energy technologies

A country's tax system can be used in several ways to achieve its renewable energy goals (OECD, 2010:111). Examples of such tax measures can be separated into three categories as outlined below (OECD, 2010:111).

Table 4: Categories of tax-based measures

Discouraging undesirable environmental practices *Placing a cost on environmentally harmful activities*	**Inducing the implementation of renewable energy** *Providing incentives for actions that will help achieve renewable energy objectives*	**Inducing innovation** *Providing positive incentives for actions that increase innovation*
Taxes on use and emissions such as a carbon tax	Tax incentives for implementation of renewable energy technology projects	Measures to reduce the cost of innovation (such as R&D tax credits, accelerated depreciation for innovation capital and enhanced allowances for R&D labour costs or reduced taxes on R&D labour).
	Accelerated depreciation for abatement of capital expenditure	Measures to increase the returns on innovations, such as reduced corporate tax rates

Source: adapted from OECD (2010:11)

The above listed headings are discussed in detail below.

2.4.3.1. Discouraging undesirable environmental practices

The measures in the first column of the table seek to discourage harmful environmental activities such as the combustion of fossil fuels by placing an economic cost on such activities. An example of this type of tax measure is the imposition of a carbon tax. (OECD, 2010:111.)

A carbon tax is a market-based instrument of which the purpose is to reduce GHG emissions by providing incentives to reduce CO_2 emissions and reduce energy demand and carbon intensity by causing two broad effects (Andersen, 2008:65):

- *Demand effect* **–** The cost of energy is increased due to the tax imposed, which results in a reduction of the energy demand.
- *Substitution effect* **–** Consumers are encouraged to substitute carbon fuels with low-carbon or carbon-neutral fuels.

It has been found that countries that impose carbon taxes experience a reduction in fuel demand (Andersen, 2008:65). The extent of the reduction in demand is, however, dependant on (Andersen, 2008:65):

- the tax rate imposed,
- how the taxes are imposed,
- how easy it is for fuel users to substitute between various fuel types and non-fuel inputs, and
- scale and secondary effects resulting from changes in economic activity.

The assumption is that lower consumption would lead to a reduction in greenhouse gasses. However, the total level of emissions will depend on the relative consumption levels of each fuel type. An economy that encourages the use of coal which is a high-carbon fuel will produce a higher level of emissions than that of an economy which encourages the use of low-carbon fuels. (Andersen, 2008:65.)

2.4.3.2. Implementation of renewable energy

The second column deals with taxation policy that is aimed at encouraging taxpayers to undertake actions that contribute to the accomplishment of renewable energy objectives. These policies include investment in renewable energy projects, exemptions on and reductions in corporate tax rates, and other ways to alleviate the tax burden of individuals and corporations that support renewable energy research and development and deployment, including tax credits and investment allowances. (OECD, 2010:111.)

Despite the economic value acquired, the implementation of tax incentives in developing countries can be a contentious matter (Van Parys & James, 2010:401). The use of tax incentives may come at a significant cost for the country implementing them. These costs do not only include financial costs such as the loss of revenue and administrative costs but, if the incentives are not carefully designed and implemented, the inefficient allocation of capital may also result in welfare costs. (Van Parys & James, 2010:401.)

In their study of the effectiveness of tax incentives in attracting investment in the CFA franc zone, Van Parys and James (2010:402) came to the conclusion that there was no compelling evidence that the reduction of the amount paid in taxes had significant impact. At the same time they did, however, find that reducing the complexity of the incentives significantly increased investments. They also found that the extension of legal guarantees to increase investor certainty, helped to attract foreign investment. The outcomes provided compelling evidence that in developing countries it would be more important to reduce the compliance cost of taxes than merely reducing the tax burden itself. (Van Parys, & James, 2010:402.)

By contrast, Doshi (2012) is of the view that "… tax incentives do help spur spending and investment. They also help in sweetening the deal. Multinational companies have set up thousands of R&D centres and invested billions of dollars in R&D in China. China provides generous tax incentives for R&D. So do other developed countries like Australia [and] France. Thus, globally, many governments are encouraging R&D spending and provide corresponding incentives in the form of tax credits, tax deductions and grants. This is evidence that tax incentives help."

Therefore, even though Van Parys and James found that there is no convincing evidence of the effectiveness of the reduction taxes on investment, in the light of Doshi's (2012) view it can be assumed that 'tax incentives do help spur spending and investment'.

2.4.3.3. Inducing innovation

The final category (column 3) deals with tax measures that assist in the reduction of the cost of innovation. Research and development is an activity which earns a high social rate of return, contributes to economic growth and assures competitiveness. Governments are therefore encouraged to spend a significant amount of money to stimulate corporate sector investment in research and development. (Mohnen & Lokshin, 2009:1.)

According to an article published by the OECD, governments support corporate research and development for the following reasons (OECD, 2010:1):

- In order to maintain long-term economic growth, investment in research and development is generally considered to be of fundamental importance.
- Research and development contributes to national competitiveness.
- Research and development investment risk. Few R&D projects are likely to end-up by delivering marketable new products or processes. As a result, without some inducement firms will be likely to be credit constrained when investing in R&D.
- Research and development projects tend to have a ripple effect – knowledge gained spreads to other organisations that may not have borne the costs of this investment.

Research and development tax incentives have been noted as a popular governmental policy mechanism which has been implemented on a worldwide basis (Mohnen & Lokshin, 2009:1). According to Mohnen & Lokshin (2009:1), the main benefit of research and development incentives is that the implementation thereof assists in reducing corporate income taxes in proportion to the research and development effort. This has the effect that the cost of engaging in research and development activities is decreased, which in turn encourages firms to increase research and development to a level that is socially optimal (Mohnen & Lokshin, 2009:1).

The discussion above has provided an overview of the mechanics of the difference tax policies available to governmental policy makers.

2.5. THE RENEWABLE ENERGY ENVIRONMENT IN SOUTH AFRICA AND CHINA

2.5.1. Introduction

The purpose of this study is to compare the income tax incentives available in South Africa with the income tax incentives provided in China, in order to identify any gaps, alternatives and possible improvement to the current South African legislation. In line with research objective two, it is however important to provide an understanding of the renewable energy environments in South Africa as well as in China prior to the analysis and comparison of the incentives available. The following section provides an overview of the renewable energy environments in South Africa and China.

2.5.2. Current renewable energy environment in South Africa

The energy sector in South Africa is currently dominated by Eskom, a state-owned enterprise accounting for approximately 95% of energy production. Coal is currently the primary source of energy production in South Africa, with a contribution of 86% as opposed to the contribution of alternative sources such as nuclear energy and renewable energy sources which account for the balance. (Pegels, 2010:4946.)

During 2008, South Africa experienced an energy crisis which led to power outages lasting several hours and spreading like wildfire across the country (Pegels, 2010:4947). According to Krupa and Burch (2011:6258), this was the result of a combination of three major factors: mass electrification, a period of strong industrial growth, and defective planning for maximum loads that could occur. The result was that the demand for power began to exceed the available supply (Krupa & Burch, 2011:6258).

In reaction to this crisis, Eskom together with the Department of Minerals and Energy released the 'National response to South Africa's electricity shortage'. In summary, this plan addressed (Pegels, 2010:4947):

- supply-side interventions, which include the construction of two new coal-fired power stations, and
- demand-side interventions, which aim to reduce the demand of energy in the short term.

However, Pegels (2010:4947) believes that these programmes are progressing too slowly, and that the electricity sector faces three major problems. Firstly, electricity undersupply, which results in an inadequate reserve margin. Secondly, Eskom estimates that it will require over R300 billion over the next decade for the extension of power infrastructure, while Eskom is underfunded. Lastly, the country's high emission intensity, which results in environmental damage. (Pegels, 2010:4947.)

Until recently the shift towards renewable energy technology as opposed to the use of fossil fuels was perceived to represent an unnecessary economic cost. The need for renewable energy in South Africa has, however, in recent years become increasingly important and has created an opportunity to foster a more secure, labour intensive and sustainable economy and society. (Pegels, 2010:4948.) As Edkins *et al* (2010:ii) point out, "renewable energy could be the technological key to economically and socially sustainable societies".

According to Musango (2011:125), there are numerous challenges and barriers which affect the deployment of renewable energy in South Africa. The main barriers are posed by the cost of innovation and market expectations regarding the cost of energy (Pegels, 2010:4948). The consumer price of energy must be low enough to make the renewable energy commercially attractive. South Africa currently has some of the lowest energy prices in the world. The challenge is therefore to develop technologies at an initial capital cost that is low enough to produce energy at a price which can compete with conventional technologies such as coal and gas. (Pegels, 2010:4948; Parker, 2009; Musango, 2011:125 and Burch & Krupa, 2011:6256.)

Risk and uncertainty also represent a common economic barrier to renewable energy development. Because the renewable energy market is still far from mature, it is seen by financial institutions as volatile and uncertain. (Pegels, 2010:4948.) Financial institutions take this risk into consideration, which raises the cost of lending. Investments in the development of such technologies are therefore unattractive to potential investors due to high interest rates for funding. In addition, uncertainty regarding the capital return on investment can limit the financial support and mechanisms available to fund renewable energy technology projects. This uncertainty and lack of financial support poses a major barrier to potential investors in medium to large-scale renewable energy development in South Africa. (Musango, 2011:129.)

According to Rajen Ranchhoojee (2013) the Projects and Energy Director and Head of Africa at law firm Routledge Modise, the energy sector in South Africa is heavily regulated. Enterprises that wish to engage in renewable energy generation are required to obtain an electricity generation licence from the National Energy Regulator South Africa ('Nersa'). In addition, enterprises are only entitled to provide electricity under private purchase agreements (PPA) with industrial entities or Eskom and are not able to simply provide energy to the public. (Ranchoojee, 2013.)

To ensure the reliable and efficient supply of electricity, at least 3 725 megawatts are required to be drawn from renewable energy sources, according to experts. The renewable energy initiative in South Africa is largely driven by the Independent Power Producer Procurement Programme (IPP). The main purpose of the IPP is to assist the government in meeting the target of 3 725 megawatts and to provide support for the development of the renewable industry in South Africa. The IPP requires bidders to bid on tariffs and the identified socio-economic developments. The tariff will be payable by the buyer in terms of the PPA to be entered into between the buyer and the project company of a preferred bidder. (Department of Energy, 2012.)

One of the requirements of the IPP is that a certain percentage of the components for the renewable energy project (such as wind turbines and solar panels) are locally sourced. This creates difficulty with regard to the cost of projects, because local content is significantly more expensive than content which is sourced internationally. (Ranchoojee, 2013.)

It is expected that rising electricity prices will make investments in renewable energy projects more viable for investors in the future, nevertheless these technologies still require considerable support in order to be commercially viable on a larger scale (Pegels, 2010:4949). According to Parker (2009), 'tax incentives, if properly structured, can play a valuable role in moving South Africa toward a sustainable energy future'.

2.5.3. The current renewable energy environment in China

China is currently one of the largest and fastest growing economies in the world. As a consequence of the rapid process of industrialisation and urbanisation, China's GHG emissions have increased substantially. The country's energy system is predominantly coal driven and faces a variety of problems such as shortages of resources, low energy efficiency, high emissions and environmental damage and a lack of effective management systems. Renewable energy thus plays an important role in the development of China's power sector. In 2010, China was found to be the leader in renewable energy for the second year in a row as it attracted USD 49 billion in new investments. This investment exceeded two-thirds of emerging country investments and more than a third of global investments in renewable energy during 2010. (Peidong, Yanli, Jin, Yonghong, Lisjeng & Xinrong, 2009:440.)

Although, in terms of the Kyoto Protocol, there is no legally binding requirement for China to cut carbon dioxide emissions, the Chinese government has nevertheless been proactive and has implemented numerous renewable energy policies and regulations (Peidong *et al* , 2009:441). As a result of this, China currently has one of the most attractive markets for renewable energy investment in the world (Ernst and Young , 2012:21).

One of the most significant moves by China's government was the introduction of the renewable energy law on 28 February 2005, which was followed by the implementation of detailed regulations (Martinot, 2010:287). This law was intended to address the following five goals (Martinot, 2010:287):

- establish the importance of renewable energy in China's national energy strategy,
- remove market barriers,
- create markets for renewable energy,
- establish a financial guarantee system, and
- create awareness, skills and understanding.

The fundamental purpose of the renewable energy legislation was to provide a framework of responsibility that places the responsibility and authority for the setting of targets and the formulation of plans and financial measures with the national government (Martinot, 2010, 289).

According to Go (in Jackson, 2011:16), China has demonstrated that central government support and a vibrant capital market to provide finance are necessary to build the renewable energy industry, and Peidong *et al* (2009:447) indicate that the Chinese government has stipulated principals and policies to encourage and develop renewable energy, such as the economic encouragement policy, which is made up of the following components (Peidong *et al*, 2009:447):

- Financial subsidy: this is the most conventional economic encouragement practice. This policy can vary in form to include investment, product and user subsidies.
- Favourable taxation policy: this is currently the most universal encouragement policy.
- Favourable price policy: this policy is mainly intended for network power produced with renewable energy.

As shown above, China has numerous renewable energy technologies and there is much to be learnt from China in respect of their renewable energy policies and regulations.

2.6. CONCLUSION

This chapter provided a general overview of current renewable energy technologies together with an overview of the key benefits associated with renewable energy, which highlights the importance thereof. Furthermore, it provided an overview of the general governmental policies available to policy makers to advance renewable energy technologies and stimulate markets. In line with objective two outlined in chapter 1 above, a general understanding of the importance of renewable energy technology and governmental policies which are available to policy makers to advance renewable energy technologies and stimulate markets was therefore obtained in this chapter.

CHAPTER 3

ANALYSIS OF INCOME TAX INCENTIVES FOR RENEWABLE ENERGY RESEARCH AND DEVELOPMENT AND IMPLEMENTATION OF RENEWABLE ENERGY TECHNOLOGIES IN SOUTH AFRICA

3.1. INTRODUCTION

In line with the research objectives outlined in chapter 1, this chapter will provide a detailed analysis of the income tax incentives available in South Africa for renewable energy research and development and the implementation of renewable energy technology. This analysis will provide an understanding of the income tax incentives currently available in South Africa that will assist in the comparison between the income tax incentives available in South Africa and those available in China.

3.2. RESEARCH AND DEVELOPMENT TAX INCENTIVES IN SOUTH AFRICA

In 2006, section 11D was introduced into the Income Tax Act ('the Act') in order to encourage the investment in scientific or technological research and development (National Treasury, 2006:6). This program is a tax-incentive scheme and is an indirect approach by the South African government to stimulate investment in national scientific and technological research and development (National Treasury, 2006:6).

Section 11D was revamped during 2011 and guidance in respect of the amendments to the section can be found in the 'Explanatory Memorandum on the Taxation Laws Amendment Bill 2011'. According to the Explanatory Memorandum, the purpose of the revamp was to simplify and streamline the accessibility of research and development incentives. (National Treasury, 2012:78.)

Essentially, in terms of the new section 11D of the Act, the research and development incentive is split into (National Treasury, 2012:78):

- an automatic 100% deduction for tax purposes of research and development expenditure; and

- an additional 50% allowance for tax purposes that is dependent upon approval of a specific research and development project.

A detailed analysis of the mechanics of the section 11D allowances as amended follows below.

3.2.1. Section 11D – definition of research and development

Prior to the 2011 amendments, section 11D did not provide a definition of the term ‘research and development’. The focus of the previous section 11D(1) was to provide an incentive for qualifying activities undertaken in South Africa specifically for the discovery of novel, practical and non-obvious information, or the devising, developing or creation of any of the intellectual property items regulated by the listed legislation. (PwC, 2011:59.)

According to the abovementioned explanatory memorandum, a definition of ‘research and development’ was introduced in section 11D(1) in order to incentivise activities that constitute technical and scientific research and development in a commercial sense. The proviso that this applies only to activities of a scientific or technological nature was considered to be too broad and therefore created uncertainty with regard to interpretation. (PwC, 2011:60.)

In the new definition, the meaning assigned to ‘research and development’ is broader and covers incremental development of products and processes in addition to research in respect of new projects (PwC, 2011:60). The definition is now split into two sections and is defined as follows (PwC, 2011:60):

a) Systematic investigative or systematic experimental activities of which the result is uncertain for the purpose of:
    (i) Discovering non-obvious scientific or technological knowledge, or
    (ii) Creating an invention, design, computer program or knowledge essential to the use of these items [this refers to a list which is replicated from the original version of section 11D], or
b) Developing or significantly improving any of the above if that development or improvement relates to any:

(i) new or improved function;

(ii) improvement of performance;

(iii) improvement of reliability, or improvement of quality;

of that invention, design, computer program or knowledge.

3.2.2. Section 11D – automatic allowance

As noted in the previous section, the new section 11D provides for both an automatic allowance and an additional allowance. Section 11D(2) grants an automatic 100% deduction for expenditure which is incurred directly and solely in respect of research and development activities undertaken in South Africa. To qualify this expenditure must, however, be incurred in the production of income and in the course of carrying on of any trade (the meaning of the concepts of 'in the production of income' and 'in the course of carrying on a trade' will be discussed in section 3.6 below). (PwC, 2011:60.)

This section of the Act makes no reference to a requirement for the expenditure to be revenue in nature, it therefore follows that capital expenditure also qualifies for this deduction (PwC, 2011:60).

3.2.3. Section 11D – additional 50% allowance

In addition to the automatic 100% allowance discussed above, subsections (3) and (4) of the Act permit an additional 50% deduction (also referred to as the 50% uplift) of the section 11D(2) research and development expenditure. This additional allowance is conditional on approval by the Department of Science and Technology (DST) under section 11D(9). The 50% uplift can be applied retrospectively to all qualifying expenditure incurred from the time that the taxpayer's application was originally received by the Department of Trade and Industry. (PwC, 2011:60.)

The 50% uplift is available under the following circumstances (PwC, 2011:60):

- *Section 11D(3)* – expenditure incurred in respect of research and development carried on by a taxpayer which is a company;

- *Section 11D(4)* – expenditure incurred by a taxpayer to fund expenditure of another person carrying on research and development on behalf of such taxpayer.

It should be noted that for R&D expenditure which falls within section 11D(4), the extra 50% deduction is only allowed (for the funder) under the following circumstances (PwC, 2011:60):

- *Section 11D(4)(c)(i)* – a tax-exempt institute under section 10(1)(cA) (e.g. universities; or the CSIR); or
- *Section 11D(4)(c)(ii)* – a company that is part of the same 'group of companies' as the funder, provided that the other group company ('the contractor') does not claim the deduction under section 11D. In this case, section 11D(5) makes it clear that the 50% deduction for the funder is limited to 50% of the actual expenditure incurred directly and solely in respect of that R&D 'carried on' by the company being funded.

Subsections 3 and 4 of the abovementioned section 11D refer to research and development 'carried on'. According to section 11D(6), a person 'carries on' R&D if that person may determine or alter the methodology of the research (PwC, 2011:60).

3.2.4. Allowances for machinery or plant used for research and development purposes

In addition to the research and development allowance provided for in section 11D, section 12C of the Act was amended by the Taxation Laws Amendment Act (22/2012) to include new and unused machinery or plant acquired for the purposes of 'research and development'. This section now provides for an allowance for machinery or plant and equipment used for research and development purposed, that is owned by a taxpayer or acquired by him in terms of instalment sale agreement and brought into use for the first time on or after 1 April 2012. (PwC, 2011:60.)

Section 12C provides for an accelerated four-year write-off period in the ratio of 40:20:20:20 of such assets as are acquired under an agreement formally and finally signed by every party to it on or after 1 January 2012. Improvements to such assets will also qualify for the allowance. (PwC, 2011:61.)

Further to this, section 13, was amended to include buildings erected or acquired by a taxpayer and used in any process of 'research and development', for which a 5% deduction is allowed per annum (PwC, 2011:61).

As noted in discussion of section 11D above, section 11D makes no reference to a requirement for the qualifying expenditure to be revenue in nature and that it therefore follows that capital expenditure also qualifies for this deduction. It is therefore not clear whether this section may be applied to assets such as machinery and fixed property and whether it is intended that fixed assets such as plant, equipment and buildings might then also automatically qualify for the automatic and uplift allowances, as an alternative to allowance provided in section 12C. (PwC, 2011:62.)

In summary, an accelerated capital allowance in the ratio of 40:20:20:20 is available in respect of any new and unused machinery or plant acquired for the purposes of 'research and development' and a 5% allowance is allowed in respect of buildings erected or acquired by a taxpayer used in any process of 'research and development'.

Section 23B of the Act provides guidance in the event that an amount qualifies for a deduction or allowance in terms of more than one section of the Act. In terms of section 23B, no amount or part of an amount may be allowed or taken into account more than once as a deduction, allowance or otherwise in the determination of a persons' taxable income. It therefore follows than if an amount which is capital in nature is claimed as a deduction under section 11D of the Act, no additional allowance will be allowed under section 12C or section 13 of the Act by virtue of section 23B.(Stiglingh, Koekemoer, van Schalkwyk, Wilcocks & de Swart, 2013:143.)

3.2.5. Conclusion regarding South African incentives

Following from the previous sections, we may conclude that the South African taxation system provides the following R&D tax incentives to taxpayers:

Table 5: Summary of research and development tax incentives available in South Africa

TAX INCENTIVE	DESCRIPTION
Automatic allowance	An automatic 100% deduction for R&D expenditure
Additional 50% allowance	An additional 50% allowance which is dependent upon approval of the respective R&D project.
Allowances for capital expenditure	Section 12C provides for an accelerated four-year (40:20:20:20) write-off period of such assets as are acquired under an agreement formally and finally signed by every party to it on or after 1 January 2012. Improvements to such assets will also qualify for the allowance. Section13 provides a 5% allowance per annum in respect of buildings used in any process of 'research and development'.

It follows that, provided that the requirements as set out in sections 11D, 12C and 13 of the Act are met, research and development expenditure incurred in respect of renewable energy technology will qualify for the aforementioned allowances that sections 11D, 12C and 13 of the Act provide for.

3.3. ALLOWANCES FOR MOVABLE ASSETS USED IN THE PRODUCTION OF RENEWABLE ENERGY

Section 12B(1)(h) of the Act provides for an accelerated capital allowance in respect of any machinery, plant, implements and utensils owned by a taxpayer, or acquired in terms of an instalment credit agreement, which are brought into use for the first time for the purpose of the taxpayer's trade and used by that taxpayer in the generation of electricity from wind, sunlight, gravitational water forces (limited to

30Mw) or biomass comprising organic wastes, landfill gas or plants (Stiglingh *et al*, 2013:227).

The accelerated capital allowance provides for a three-year write- off period which operates on a 50:30:20 basis. The capital allowance which is granted under section 12B(1)(h) is to be calculated on an amount that is deemed to be the lesser of the actual cost of such assets to the taxpayer, or the cost which a person would, if he acquired the asset under a cash transaction concluded at arm's length, have incurred in respect of the direct cost of acquisition of the asset, including the direct cost of installation or erection thereof. (Stiglingh *et al*, 2013:227.)

It should be noted that, in terms of section 23J of the Act, where machinery, plant implements or utensils are acquired from a connected person as defined in section 1 of the Act, the section 12B(1)(h) allowance will be limited to the cost incurred by the connected person in this regard (Stiglingh *et al*, 2013:216).

3.4. ALLOWANCES IN RESPECT OF AFFECTED ASSETS

Section 12D of the Act provides for an allowance of 5% per annum in respect of the acquisition of any new and unused affected asset. In such case, an affected asset would include, *inter alia*, any line or cable used for the transmission of electricity, including any earthworks or supporting structures forming part of the line or cable. (Stiglingh *et al*, 2013:251.)

In terms of section 12D, the allowance is calculated on the basis of the cost of any new or unused affected asset which is owned by the taxpayer and is brought into use for the first time by such taxpayer and used directly for purposes contemplated in the definition of 'affected asset'. Furthermore, the allowance is only available to the extent that such affected asset is used in the production of his income. (Stiglingh *et al*, 2013:251.)

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3.5. CERTIFIED EMISSION REDUCTIONS – SECTION 12K

The clean development mechanism (CDM) was introduced by Article 12 of Kyoto Protocol in 2003, the purpose of which is to assist developing countries in the reduction of their carbon emissions. In terms of the CDM, projects which are aimed at the reduction of carbon emissions in developing countries are eligible for certified emission reduction credits (CERs). Each CER is equivalent to one ton of carbon dioxide. These CERs can be traded and sold, which provides a cost-effective vehicle for industrialised countries to manage their emission reduction targets under the Kyoto Protocol. (United Nations Framework Convention on Climate Change, 2013.)

There are two basic types of CDM projects (United Nations Framework Convention on Climate Change, 2013):

- Projects aimed at contributing to a transition from the consumption of power derived from the combustion of fossil fuels to the use of less carbon-intensive fuels.
- Projects designed to promote the efficiency of all energy systems

The main benefit of such project-based mechanisms is that they can assist in the reduction of the costs associated with meeting the Kyoto Protocol emission reduction targets. In addition to this, CDM projects have the potential to support the objectives of developing countries with regard to sustainable development. The intention with the CDM mechanism is therefore to reduce the emission of greenhouse gases by contributing to sustainable development in developing countries while accomplishing a reduction of carbon emissions in industrialised countries. (United Nations Framework Convention on Climate Change, 2013.)

In South Africa, an activity can only qualify as a CDM project if it is approved by the Department of Minerals and Energy and is registered with the United Nations Framework Convention on Climate Change Committee executive board. In terms of section 12K, any amount received by or accrued to any person on or after 11 February 2009 in respect of the disposal of any CER issued in the furtherance of a qualifying CDM project registered on or before 31 December 2012, will be exempt from taxation. (Stiglingh *et al*, 2013:217.)

3.6. THE *IN THE PRODUCTION OF INCOME* AND *FOR THE PURPOSES OF TRADE* REQUIREMENTS

The 'in the production of income' requirement in the context of the Act, refers to all expenditure attached to the performance of a business operation, incurred bona fide for the performance of the operation. Case law dictates that in order for expenditure to be deductible for tax purposes, such expenditure must be shown to be closely connected to the income-earning activity from which it arose. In addition, the expenditure must be considered to be a necessary concomitant of the business activities of the company wishing to claim the deduction. (Stiglingh *et al*, 2013:133.)

In the *Port Elizabeth Electric Tramway Co Ltd v CIR* 1936 CPD 241 8 SATC 13 case it was held that it should also be determined how closely the expenditure is linked to the actions that produce income and therefore whether such expenditure incurred is regarded as a necessary concomitant of the income-earning activities.

The term 'trade' is given a very wide meaning in section 1 and includes every profession, trade, business, employment, calling, occupation or venture, including the letting of property. 'Trade' implies an active occupation, as opposed to the passive earning of investment income. (Stiglingh *et al*, 2013:127.)

In *Burgess v CIR* 1993 (4) SA 161 (AD) [1993] 2 All SA 496 (A) the principle that this definition should be given a wide interpretation was described as being well established. It was also pointed out that the definition is not necessarily exhaustive.

In terms of *ITC 615* (1946) 14 SATC 399 it is submitted that in appropriate circumstances a taxpayer will be deemed to be carrying on a trade even if he has no objective to make a 'profit' or even if he deliberately sets out to make a loss. But the absence of such an objective or of the prospect of making profits might indicate, along with other factors, that he contemplated purposes other than trade or was not exclusively concerned with trade. (*ITC 1385* (1984) 46 SATC 111.)

3.7. CONCLUSION

In summary, the following income tax incentives are available to taxpayers in South Africa in respect of the implementation of renewable energy technologies:

- An accelerated capital allowance in respect of any machinery, plant, implements and utensils used by that taxpayer in the generation of electricity from wind, sunlight, gravitational water forces (limited to 30Mw) or biomass comprising organic wastes, landfill gas or plants'.
- An allowance of 5% per annum in respect of the acquisition of any new and unused line or cable used for the transmission of electricity, including any earthworks or supporting structures forming part of the line or cable'.
- An exemption from income tax of any amount received by or accrued to any person in respect of the disposal on or after 11 February 2009 of any CER issued in the furtherance of a qualifying CDM project registered on or before 31 December 2012.

The aforementioned income tax incentives were analysed and evaluated, which provided an understanding of the income tax incentives currently available in South Africa. A detailed analysis of the income tax incentives available in China for renewable energy research and development and implementation of technologies will be performed in the following chapter.

The analysis of the income tax incentives available in South Africa identified in this chapter, together with the analysis of the tax incentives available in China which will be provided in chapter 4, will assist in the comparison performed in Chapter 5.

CHAPTER 4

ANALYSIS OF INCENTIVES FOR RENEWABLE ENERGY RESEARCH AND DEVELOPMENT AND THE IMPLEMENTATION OF RENEWABLE ENERGY TECHNOLOGIES IN CHINA

4.1. INTRODUCTION

In line with the research objectives outlined in chapter 1, a detailed analysis of the income tax incentives available in China for renewable energy research and development and the implementation of renewable technologies was performed.

4.2. RESEARCH AND DEVELOPMENT INCENTIVES IN CHINA

China offers generous fiscal incentives to encourage research and development activities and investments in innovation. Since setting up the 'dual enterprise income tax system' which is referred to as the 'New Law' in the 1980s, China has adopted a series of preferential taxation policies. (Chan & Cheung, 2010:58.) According to Chan & Cheung (2010:71), "These favourable tax incentives have successfully played a positive role in attracting a huge amount of foreign investment and importing advanced technologies and management skills to China, while promoting its technological progress and innovation"

4.2.1. Super-deduction of research and development expenses

The Chinese tax laws provide for a super-deduction of qualifying R&D expenses incurred by an enterprise for new technology, new products, and new production techniques (Chan & Cheung, 2010:58). In summary, the super-deduction is available as follows (Chan & Cheung, 2010:58):

- *R&D expenses that are not capitalised* – the enterprise is entitled to an additional 50% deduction on top of the actual qualified R&D expenses deduction.

- *R&D expenses that are capitalised* – the enterprise can amortise the capitalised intangible asset on 150% of the actual costs incurred.

On December 10, 2008, the State Administration of Taxation (SAT) issued Administrative Circular 116 (Circular 116), which provides guidance on the super-deduction for R&D expenses under the New Law. Circular 116 specifies the relevant conditions and scope of R&D expenditure by 'qualified enterprises' that will qualify for the super-deduction referred to above. (Chan & Cheung, 2010:58.) This incentive is discussed in detail below.

4.2.2. Qualified enterprises

The additional 50% super-deduction of research and development expenses is only available to 'resident enterprises' which have a sound financial accounting system and that can accurately account for research and development expenses. Non-resident enterprises or resident enterprises which are not in a position to accurately account for their research and development expenditure would therefore not be entitled to enjoy the benefits of the super-deduction of research and development expenditure.(Chan & Cheung, 2010:58-59.)

In terms of the New Law, the term 'resident enterprise' refers to the following (Chan & Cheung, 2010:59):

- an enterprise that is established according to Chinese law; or
- an enterprise established according to foreign law, but with its effective management located in China.

4.2.3. Qualifying research and development activities

Qualifying research and development activities are defined as 'continuous research and development activities with definite objectives carried out by an enterprise to acquire new knowledge of science and technology to make innovative use of the knowledge or to substantially improve technology, production techniques or product (services).' It should be noted however, that routine upgrades or simple applications of research and development results, do not meet the aforementioned definition of qualifying research and development activities. (Chan & Cheung, 2010:59.)

4.2.4. Qualifying research and development expenses

In order to claim the super-deduction, the research and development expenditure must fall within one of the eight categories. In addition, this expenditure must be incurred directly in respect of qualifying research and development activities as described above. (Chan & Cheung, 2010:59.) The following categories of expenditure are eligible for the super-deduction (Chan & Cheung, 2010:59):

- design fees for new products, expenses for formulating procedures relating to new skills, and expenditures for technical books and information and translation fees directly related to research and development activities;
- materials, fuel and power consumed directly for research and development activities;
- salaries, wages, bonuses and allowances of employees directly engaged in research and development activities;
- depreciation expenses or rentals for apparatus and equipment exclusively used for R&D activities;
- amortisation expenses of intangible assets such as software, patent rights, non-patented technologies exclusively used for research and development activities;
- development and manufacturing costs of equipment and moulds exclusively used for intermediate testing and experiments;
- on-site testing expenditures for exploration technology;
- expenditures for verification, assessment and recognition of research and development results.

4.2.5. Problems related to the research and development super-deduction

According to Chan & Cheung (2010:60), there are several potential problems which arise in relation to research and development super-deduction. They are:

- There are no specific standards to differentiate between what constitutes day-to-day improvements, and *substantial* improvements for manufacturing enterprises.
- The inclusion of substantial improvements to services ('substantially improve technology, production techniques or product (*services*)' – section 4.2.3 above) means that only advanced or high-tech enterprises in the service industry could apply for the research and development super-deduction. Thus, both HNTE incentives (see section 4.3 below), and super-deductions for research and development can be simultaneously available.
- The threshold for the super-deduction for research and development expenses is high.

4.2.6. Allowances for research and development capital expenditure

In addition to the super-deduction of non-capital research and development expenditure discussed above, the New Law and its Implementation Rules both provide for tax incentives in respect of capital research and development expenditure. Under the New Law, an enterprise which holds fixed assets which are subject to advancements in technology may be eligible for an accelerated depreciation period. (Chan & Cheung, 2010:60.) In terms of the Implementation Rules, such assets include (Chan & Cheung, 2010:60):

- fixed assets affected by accelerated development of next-generation products due to advancements in technology; and
- fixed assets subject to constant exposure to high-tremor and high-corrosion conditions.

In terms of the Chinese tax laws, depending on their value, equipment can be either expensed immediately or can be depreciated on an accelerated basis. The cost of research and development equipment with a unit value that does not exceed

RMB 300 000 can be expensed immediately. However, if the value of the equipment is above RMB 300 000, it can be depreciated on an accelerated basis as discussed above. Where an accelerated depreciation period is applied, the shortest depreciation period shall not be less than 60% of the minimum depreciation period as specified in the tax laws. (Chan & Cheung, 2010:60.)

4.3. HIGH AND NEW TECHNOLOGY ENTERPRISE

In addition to the above allowances, the New Law introduced a special incentive which applies to High and New Technology Enterprises (HNTE) which, according to Chan & Cheung (2010:60), "is one of the most attractive tax incentive used as a catalyst in promoting the integration of technological progress and economic growth, and facilitating the development of industries towards a high tech era for China."

The HNTE tax incentive provides for the application of a lower tax rate of 15% as opposed to a tax rate of 25%. This incentive is available across the whole nation to all enterprises that meet the requirements and the lower rate can be applicable to the entire income of an enterprise. (Chan & Cheung, 2010:60.)

The purpose of this tax incentive is to grant preferential tax treatment to industries and projects that are supported and encouraged by the Chinese government. Such projects and industries would include those working in the areas of environmental protection, energy conservation, and water conservation as well as certain technology transfers. (Chan & Cheung, 2010:60.)

The HNTE tax regime is similar to that of the 'patent box' regime which has been adopted by a number of European Union countries. Tax incentives which encourage innovation can be provided either at the front-end of the innovation cycle, in the years in which research and development expenditure is incurred (such as the research and development super-deduction discussed above) and/or at the back end of the cycle when income is generate from the exploitation of the intellectual property. The concept of the 'patent box' regime was introduced to provide back-end incentives that provide a reduced corporate income tax rate for certain income which is generated from the exploitation of intellectual property, generally by a 50-80%

reduction of such income. China's HNTE tax regime, while not called a 'patent box', is even broader and includes types of commercial 'know innovation' within the regime. (PwC,2013:7.)

The New Law provides for an income tax based incentive in respect of state-encouraged HNTEs in the form of a reduced enterprise income rate of 15%, compared with the regular income tax rate of 25% (Chan & Cheung, 2010:60).The Implementation Rules stipulate that the description 'state-encouraged HNTEs' refers to enterprises that hold an independent ownership of core proprietary intellectual property rights, and simultaneously meet the following criteria (Chang & Cheung, 2010:60):

- The products or services provided shall fall within the specific scope of state-encouraged high-new technologies.
- The ratio of research and development expenditures to the enterprise's total income shall not be less than the ratio stipulated.
- The ratio of income from high-new technology products or services to total income shall not be less than the ratio stipulated.
- The proportion of employees working in the science and technology field as a percentage of the total number of staff shall not be less than the ratio stipulated.
- The enterprise shall abide by any rules for assessment or other conditions stipulated jointly by the Ministry of Science and Technology, the Ministry of Finance and SAT for the verification and administration of HNTEs.

4.4. THE CLEAN DEVELOPMENT MECHANISM (CDM)

As mentioned in chapter 3, the Clean Development Mechanism (CDM) was introduced by Article 12 of the Kyoto Protocol in 2003 as a measure aimed at the general reduction of GHG emissions. The CDM issues certified emission reductions (CERs) (carbon credits) for emission reductions achieved by CDM projects, generally in developing countries. Industrialised countries can then buy these CERS (or trade them in the market) and use them to offset emissions that exceed permissible limits in their own countries, and thus effectively invest in emission reductions in developing countries. Each CER is equivalent to 1 ton of carbon dioxide.

In China, enterprises that operate CDM projects are exempt from corporate income tax in respect of the following income received (KPMG, 2012:17):

- The portion of Carbon Emissions Reductions proceeds that are shared by the government.
- Donations received from international financial organisations, domestic and foreign entities or individuals.
- Interest income which is derived from capital deposits or national bonds.

In addition to the above, enterprises that are engaged in CDM projects enjoy a three-year exemption from corporate income tax, followed by another three-year 50% reduction of the corporate income tax rate in respect of income derived from qualifying CDM projects. This exemption is allowed from the first year that the revenue derived from the transfer of greenhouse gas emission reductions is received. (KPMG, 2012:17.)

4.5. ENVIRONMENTAL PROTECTION AND ENERGY OR WATER CONSERVATION PROJECTS

A full corporate income tax exemption for a period of three years is allowed, which is then followed by a 50% reduction on the corporate income tax (CIT) rate for an additional three-year period for income derived from qualified environmental protection and energy or water conservation projects. This exemption is allowed from the first year that revenue is derived. (KPMG, 2012:17.)

Applicable projects include projects that involve biomaterial energy, synergistic development and utilisation of methane, and technological innovation in energy conservation and emission (KPMG, 2012:17).

4.6. SPECIAL EQUIPMENT FOR ENVIRONMENTAL PROTECTION, ENERGY OR WATER CONSERVATION AND PRODUCTION SAFETY

A tax credit of 10% of the amount which is invested in equipment that qualifies as special equipment for environmental protection, energy and water conservation and production safety is available for set-off against corporate income tax payable. The credit is available against the corporate tax payable for the year in which the investment is made. (KPMG, 2012:17.)

4.7. SYNERGISTIC UTILISATION OF RESOURCES AS RAW MATERIALS

For corporate income tax purposes, taxpayers are only required to take into account 90% of the total revenue which is derived from the use of specific resources associated with the synergistic utilisation of raw materials in the production of goods (KPMG, 2012:17).

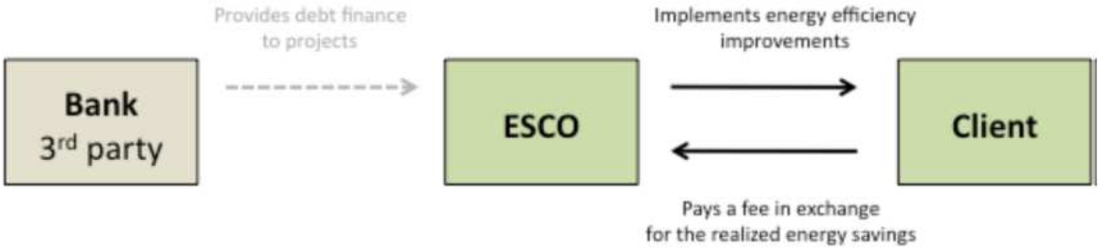
4.8. PREFERENTIAL TAX TREATMENT OF ENERGY SERVICE COMPANIES (ESCOS)

'Energy service company' (ESCO) is a term that refers to a company that is in the business of providing energy solutions to energy users. Such energy solutions include the following (National Association of Energy Service Companies, 2011):

- design and implementation of energy savings projects,
- energy conservation,
- energy infrastructure outsourcing,
- power generation and energy supply, and
- risk management.

The following diagram shows the exchanged cash flows in a simplified ESCO project:

Figure 3: Cash flows in a simplified ESCO project



Source: Syntropolis (undated)

A full corporate income tax exemption for a period of three years, followed by a 50% reduction on the CIT rate for an additional three-year period is available for income derived from an energy performance contract (EPC) by a qualifying ESCO (KMPG, 2012:18).

If an ESCO transfers assets which originated in the course of an EPC project to the energy user at the end of the term of the energy management contract (EMC), the assets are deemed to be fully depreciated in the hands of the ESCO for corporate income tax purposes. Similarly, the energy user is then deemed to have received the project assets from the ESCO, as if they have been fully depreciated (KMPG, 2012:18). Furthermore, the ESCO will not take into account any contributions made by the energy user in respect of the transfer of the assets. It follows that the ESCO will therefore not be required to recognise any revenue for corporate tax purposes in respect of the transfer of assets to the energy user. (KMPG, 2012:18.)

Finally, an energy user who takes part in an EPC project is entitled to deduct expenditure which has been actually incurred in accordance with the EMC for corporate income tax purposes, provided that the expenditure is considered to be reasonable (KMPG, 2012:18).

4.9. INVESTMENT IN ENERGY EFFICIENT EQUIPMENT

An additional incentive is provided to encourage the investment in energy-efficient products. Companies that derive revenue from the production and sale of certain energy efficient equipment are allowed to exclude 10% of the revenue derived from such equipment for the purposes of determining their corporate tax liability. Similarly, enterprises that invest in special equipment for energy conservation will obtain a credit against tax payable equal to 10% of the amount invested in the equipment in the year in which the investment is made. In the event that the tax credit amount exceeds the company's tax liability, the excess credit may be carried forward for a period of up to a maximum of five tax years. Equipment that qualifies for this incentive would include cooling towers and power saving equipment. (KMPG, 2012:18.)

4.10. CONCLUSION

Chapter 4 provided an analysis of the income tax incentives available to taxpayers in China for renewable energy research and development and the implementation of renewable energy technologies. It is clear that China offers generous fiscal incentives to encourage research and development activities and investments in innovation.

A comparative analysis together with a hypothetical case study is undertaken in chapter 5 to compare the research and development and implementation tax incentives outlined in chapter 3 and chapter 4, in order to highlight any differences, benefits and limitations in South Africa's current legislation in comparison with Chines legislation.

CHAPTER 5

COMPARISON OF THE INCOME TAX INCENTIVES AVAILABLE IN SOUTH AFRICA AND CHINA FOR RENEWABLE ENERGY RESEARCH AND DEVELOPMENT AND THE IMPLEMENTATION OF RENEWABLE ENERGY TECHNOLOGIES

5.1. INTRODUCTION

In line with the research objectives outlined in chapter 1, this chapter provides a detailed comparison of the income tax incentives available in China and South Africa for renewable energy research and development and the implementation of renewable energy technologies as identified in chapters 3 and 4 respectively.

5.2. DETAILED COMPARISON

In the table below, the summarised income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa as identified in chapter 3 are compared with the tax incentives available in China identified in chapter 4.

Table 6: Comparison of tax incentives for renewable energy research and development and implementation of renewable energy technologies in China and South Africa

CHINA	SOUTH AFRICA
Research and development allowance Qualified R&D expenditure can enjoy 'super-deduction' for income tax purposes. Eg: for 100% qualified R&D expenditure, a company can claim a deduction of 150%.	**Research and development allowance** In terms of the new section 11D, qualifying R&D activities qualify for an automatic 100% deduction for research and development expenditure; and an additional 50% allowance which is dependent upon approval of the respective research and development project.

Allowances for research and development capital expenditure An enterprise that holds fixed assets that are subject to advancements in technology may be eligible for an accelerated depreciation period	**Allowances for machinery or plant used for research and development purposes** Section 12C provides for an accelerated four-year (40:20:20:20). write-off period of such assets
High-new Technology Enterprise (HNTE/ 'Patent Box') The HNTE tax incentive provides for the application of a lower tax rate of 15% as opposed to a tax rate of 25%.	**High-new Technology Enterprise (HNTE/ 'Patent Box')** No similar incentive identified during the research performed
The Clean Development Mechanism (CDM) Enterprises that operate CDM projects are exempt from corporate income tax in respect of the following income received: • the portion of Carbon Emissions Reductions proceeds that is shared by the government, • donations from international financial organisations, • interest income derived from capital deposit or national bonds, • donations from domestic and foreign entities or individuals. Furthermore, enterprises that are engaged in CDM projects enjoy corporate income tax exemption for a period of three years followed by another three-year period of 50% reduction of the corporate income tax rate in respect of income derived from qualifying CDM projects	**The Clean Development Mechanism (CDM)** Any amount received by or accrued to any person in respect of the disposal on or after 11 February 2009 of any CER issued in the furtherance of a qualifying CDM project registered on or before 31 December 2012, will be exempt from taxation
Environmental protection and energy or water conservation projects A full corporate income tax exemption for a period of three years which is then followed by a 50% reduction for the corporate income tax (CIT) rate for an additional three year period is available for income which derived from qualified environmental protection and energy or water conservation projects.	**Environmental protection and energy or water conservation projects** No similar incentive identified during the research performed

Allowances for movable assets used in the production of renewable energy 10% of the amount invested in the qualified equipment credited against CIT payable for the current year with any unutilised investment credit eligible to be carried forward for succeeding five tax years, if such equipment is qualified as special equipment for environmental protection, energy, or water conservation and production safety.	**Allowances for movable assets used in the production of renewable energy** The accelerated capital allowance operates on a 50:30:20 basis and therefore allows for a write off of the cost of the assets over a period of three years.
Investment in energy efficient equipment Companies that derive revenue from the production and sale of certain energy efficient equipment are allowed to exclude 10% of the revenue derived from such equipment for the purposes of determining their corporate tax liability.	**Investment in energy efficient equipment** No similar incentive identified during the research performed
Synergistic utilisation of resources as raw materials Only 90% of the revenue derived from the use of specific resources associated with synergistic utilisation of resources as raw materials in the production of goods is taken into account for CIT computation purpose.	**Synergistic utilisation of resources as raw materials** No similar incentive identified during the research performed
ESCOs Starting from the tax year in which the revenue from the project first arises, a qualified ESCO that takes part in an EPC project will be eligible for a tax exemption in the first three years and a tax reduction by half (an effective rate of 12.5%) over the next three years. When the ESCO transfers the project assets to the energy user at the end of the term of the EMC, the ESCO will not have to recognise any revenue to take into account the contributions the energy user has made to the price of the assets An energy user in an EPC project can deduct reasonable expenses actually incurred in accordance with the EMC as and when they are incurred for CIT purposes	**ESCOs** No similar incentive identified during the research performed No similar incentive identified during the research performed No similar incentive identified during the research performed

Allowances in respect of affected assets	**Allowances in respect of affected assets**
No similar incentive identified during the research performed	Section 12D of the Act provides for an allowance of 5% per annum in respect of the acquisition of any new and unused affected asset. In such case, an affected asset would include, inter alia, any line or cable used for the transmission of electricity, including any earthworks or supporting structures forming part of the line or cable.

Source: Chapter 3 and chapter 4

Based on the comparison in the table above, the following were identified:

- The section 11D research and development tax allowance is similar to the research and development super-deduction provided in China.
- South Africa does not have a 'patent box' regime to stimulate the end of the innovation cycle when income is generated from the exploitation of the technology, whereas China has the HNTE regime which provides a significant financial incentive to taxpayers who are in a tax-paying position.
- South Africa and China have similar incentives in respect of the CDN; however, South Africa only provides and exemption for income derived from the sale of CERS, while China provides three years' exemption on corporate income tax, followed by a 50% reduction of the corporate income tax rate for the next three years, for income derived from specified CDM projects. China therefore provides a significantly more financially beneficial incentive.
- With regard to environmental protection and energy or water conservation projects, China provides corporate income tax exemption for three years, followed by 50% reduction of the corporate income tax rate for the next three years. South Africa does not provide a similar incentive.
- China provides a tax credit of 10% of the amount invested in equipment that qualifies as special equipment for environmental protection, energy, or water conservation and production safety, that can be set off against corporate income tax payable. South Africa, on the other hand, provides only an accelerated capital allowance over three year in respect of the cost of the investment in the assets. China therefore provides an addition tax deduction.

- For the purposes of determining their corporate tax liability, China provides companies that derive revenue from the production and sale of certain energy efficient equipment with an exclusion amounting to 10% of the revenue derived from such equipment. South Africa, however, does not provide a similar incentive.
- China provides energy service companies with significantly financially beneficial incentives, while South Africa does not provide any similar incentives.

In order to contextualise the effect of certain of the incentives available in South Africa as opposed to those available in China, a hypothetical case study will be performed.

5.3. HYPOTHETICAL CASE STUDY PERFORMED

The following case study focuses on the implementation of a wind farm by a local enterprise. As a basis for the case study, similar wind farm projects were investigated. A financial model prepared in respect of a wind farm project was analysed and formed the basis for the information provided in the case study. Due to the confidentiality and sensitivity of the information contained in the financial model analysed, it was decided to adapt the information analysed in the financial model in order to use it in the hypothetical scenario.

The aim of the case study was merely to illustrate the practical application of theory considered in chapters 3 and 4in order to make general recommendations for possible improvements to the current tax incentive legislation in South Africa and future research opportunities in respect of renewable energy research and development and the implementation of renewable energy technologies. The case study does not (as mentioned in the delimitations in chapter 1) address the political, economic and policy aspects of the implementation of the tax incentives or any other aspect, other than the pure application of the current corporate tax law in South Africa and China.

For the purposes of this case study it is assumed that the research and development phase and the implementation phase of the innovation cycle are undertaken by two separate enterprises. The case study will illustrate the effect of the tax incentive for research and development and implementation of wind farm technology in South Africa in comparison to the incentives available in China had these incentives been implemented in South Africa.

5.3.1. Case study

For the purposes of this study, the following was considered in order to achieve the objectives outlined in chapter 1.

Company A is in the business of research and development of wind farm technology (including the production of the wind turbines and supporting pillars). During year one company A expended R100 million on the research and development of the wind farm technology. Company A's total taxable income derived during year two from its trading activities amounted to R250 million.

During year one, company A sold a wind turbine (blades, mechanics and supporting pillars) to company B for an amount of R20 million. Company B is an energy service company (ESCO) that is in the business of providing energy solutions. Company B's total taxable income derived from its trading activities in years one, two, three and four amounted to R150 million, R200 million, R250 million and R300 million respectively.

Based on the information provided, the relevant tax liabilities of company A and company B respectively were calculated based on the applicable income tax incentives currently available in South Africa. The relevant tax liabilities of company A and company B respectively were then calculated based on the applicable tax incentives currently available in China **as if** they had been available to the two companies in South Africa.

In the table below, the income tax incentives currently available in South Africa for the research and development of renewable energy were applied to Company A's taxable income of R250 million (prior to the sale of turbines and research and development incentives). Based on these income tax incentives, company A's corporate income tax liability amounts to R33.6 million.

The income tax incentives currently available in China for the research and development of renewable energy **as if** they were available to taxpayers in South Africa were then applied to Company A's taxable income of R250 million (prior to the sale of turbines and research and development incentives). Based on these tax incentives, company A's corporate income tax liability amounts to R18 million. **Had the tax incentives** currently available in China for the research and development of renewable energy been applied in South Africa, they would have resulted **in an additional tax saving of R15.6 million** in comparison with the tax incentives currently available in South Africa for the research and development of renewable energy.

Next, the income tax incentives currently available in South Africa for the implementation of renewable energy technologies were applied to Company B's taxable income of R150 million, R200 million, R250 million and R300 million (prior to sale of turbines and research and development incentives) respectively for four consecutive years. Based on these tax incentives, company B's corporate income tax liabilities over the four years amounted to R39.2 million, 54.3 million, 68.8 million and 84 million respectively. This results in a total tax liability for the four year period of R246.4 million.

The income tax incentives currently available in China for the implementation of renewable energy **as if** they were available to taxpayers in South Africa were then applied to Company B's taxable income of R150 million, R200 million, R250 million and R300 million (prior to sale of turbines and research and development incentives) respectively for four consecutive years. Based on these tax incentives, company B's corporate income tax liabilities over the four years would amount to R*nil* for the first three years and a liability of R40 million in the fourth year. This results in a total tax liability for the four-year period of R40 million. The income tax incentives currently available in China for the implementation of renewable energy technologies, had they been available in South Africa, **would therefore have resulted in a tax saving of R206,4 million in comparison to the income tax incentives currently**

available in South Africa for the implementation of renewable energy technologies over a four year period.

Table 7: Case study of the income tax incentives available in China and South Africa for R&D and implementation of wind energy technology

COMPANY A	
Current tax incentives available in South Africa	**(R)**
Total taxable income (prior to sale of turbines and research and development incentives)	250 000 000
Sale of wind turbines to company B	20 000 000
Section 11D research and development allowance (automatic 100%)	(100 000 000)
Section 11D research and development allowance (50% uplift)	(50 000 000)
Total taxable income	120 000 000
Tax liability at normal 28% tax rate	33 600 000
Tax incentives available in China, if applied in a South Africa context	
Total taxable income (prior to sale of turbines and research and development incentives)	250 000 000
Sale of wind turbines to company B	20 000 000
Research and development 150% super-deduction	(150 000 000)
Total taxable income	120 000 000
Tax liability based on the High-new Technology Enterprise (HMTE) tax rate of 15%	18 000 000
Total tax liability based on current tax incentives available in South Africa	33 600 000
Total tax liability based on tax incentives available in China	18 000 000
Tax saving	**15 600 000**

COMPANY B	
Current tax incentives available in South Africa	
Year 1	
Total taxable income (prior to incentives)	150 000 000
Section 12B(1)(h) capital allowance in respect of wind turbines purchased (50% allowance in year 1)	(10 000 000)
Total taxable income	140 000 000
Tax liability at normal 28% tax rate	**39 200 000**

COMPANY B	
Year 2	
Total taxable income (prior to incentives)	200 000 000
Section 12B(1)(h) capital allowance in respect of wind turbines purchased (30% allowance in year 2)	(6 000 000)
Total taxable income	194 000 000
Tax liability at normal 28% tax rate	**54 320 000**
Year 3	
Total taxable income (prior to incentives)	250 000 000
Section 12B(1)(h) capital allowance in respect of wind turbines purchased (20% allowance in year 3)	(4 000 000)
Total taxable income	246 000 000
Tax liability at normal 28% tax rate	**68 880 000**
Year 4	
Total taxable income	300 000 000
Tax liability at normal 28% tax rate	**84 000 000**
Total tax liability based on current tax incentives available in South Africa for the full three year period	**246 400 000**
Tax incentives available in China, if applied in a South Africa context	
Year 1	
Total taxable income	150 000 000
Tax liability (a qualified ESCO which takes part in an EPC project will be eligible for a tax exemption in the first three years)	
Special equipment for energy conservation investment: 10% credit against CIT payable – carried forward	2 000 000
Year 2	
Total taxable income (prior to incentives)	200 000 000
Tax liability (a qualified ESCO which takes part in an EPC project will be eligible for a tax exemption in the first three years)	**.**
Special equipment for energy conservation investment: 10% credit against CIT payable – carried forward	2 000 000

COMPANY B	
Year 3	
Total taxable income (prior to incentives)	250 000 000
Tax liability (a qualified ESCO which takes part in an EPC project will be eligible for a tax exemption in the first three years)	
Special equipment for energy conservation investment: 10% credit against CIT payable – carried forward	2 000 000
Year 4	
Total taxable income (prior to incentives)	300 000 000
Tax liability (a qualified ESCO which takes part in an EPC project will be eligible for a tax reduction by half over the next three years) – effective rate of 14%	42 000 000
Special equipment for energy conservation investment: 10% credited against CIT payable – carried forward	(2 000 000)
Final tax liability	**40 000 000**
Total tax liability based on current tax incentives available in China for the full three-year period	**40 000 000**
Tax saving if tax incentives available in China were available to tax payers in South Africa.	**206 400 000**

Based on the outcomes of the hypothetical case study summarised below, in a scenario where the income tax incentives currently available in China (as identified in chapter 4) for the research and development and implementation of renewable energy technology are assumed to be available to taxpayers in South Africa, the total tax saving for companies A and B taken together, would amount to R240 000 000 over a four year period. This emphasises that in a scenario purely based on the application of the income tax incentives available to taxpayers in China for renewable energy research and development and the implementation of renewable energy technologies (disregarding any political, economic and policy aspects or additional tax regimes), China provides a more beneficial tax saving than South Africa.

5.4. CONCLUSION

Based on the comparison performed above, it is evident that the number and variety of incentives for renewable energy research and development and the implementation of renewable energy technologies in China exceed the incentives that are currently available in South African. In addition, the hypothetical case study emphasised that in a scenario based purely on the application of the income tax incentives available to taxpayers in China for renewable energy research and development and the implementation of renewable energy technologies (not taking into account any political, economic and policy aspects or additional tax regimes), that China provides significantly a more beneficial tax saving than South Africa. This chapter has highlighted that there is much that can be learnt from China with regard to the implementation of income tax incentives to encourage renewable energy research and development, and the implementation of renewable energy technologies.

CHAPTER 6
SUMMARY, CONCLUSION AND VALUE OF THE STUDY

6.1. INTRODUCTION

The aim of this chapter is to assess the findings of the study in the light of the research objectives outlined in chapter 1 which originally defined the purpose of this study.

6.2. ACHIEVEMENT OF RESEARCH OBJECTIVES AND SUMMARY OF FINDINGS

The achievement of the research objectives as set out in chapter 1 and summary of findings is outlined below.

6.2.1. To provide a general understanding and overview of the importance of renewable energy technology and the governmental policies that have the potential to advance renewable energy technologies and stimulate markets

Chapter 2 provided a general understanding of the importance of renewable energy technology and governmental policies which are available to policy makers to advance renewable energy technologies.

Summary of findings on the importance of renewable energy

Energy is a vital tool to stimulate production, income generation and social development in Developing countries. Developed countries, on the other hand, are more concerned with identifying alternative energy solutions to mitigate climate change, address energy supply concerns and stimulate the creation of employment. (IPPC, 2011:191.)

Renewable energy is a general term which encompasses a variety of technologies derived from naturally replenished sources that can satisfy multiple energy service needs by the production of electricity, thermal energy and mechanical energy, as well as fuels. It was found that renewable energy technologies are an important alternative energy source that have the capacity to address multiple environmental, social and economic developmental concerns, including adaptation to climate change in developed and developing countries. (IPPC, 2011:191.)

Summary of findings on governmental policies

Governmental policies have the potential to advance technologies and stimulate markets and play a crucial role in overcoming potential barriers to renewable energy research and development and the implementation of emerging technologies. (IPCC, 2011:882).

It was found that is evident that there are various climate change policies and funding mechanisms available to governmental policy makers to encourage renewable energy research and development and the implementation of renewable energy technologies included in these policies are tax based policies. For the purposes of this study, the discussion focused on tax-based polices available for renewable energy research and development, and for the implementation of renewable energy technologies.

It was found that a country's tax system can be used in several ways to achieve its renewable energy goals (OECD, 2010:111). Firstly, taxes on use and emissions such as a carbon tax seek to discourage harmful environmental activities such as the combustion of fossil fuels by placing an economic cost on such activities. Secondly, tax incentives for implementation of renewable energy technology projects encourage taxpayers to undertake actions that will assist in achieving renewable energy objectives. Finally, measures aimed at innovation have the capacity to reduce the cost of innovation.

6.2.2. To critically analyse and evaluate the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa and China.

An understanding of the renewable energy environments in South Africa and China was provided at the end of chapter 2 prior to the analysis and comparison of the incentives available. A critical analysis of the income tax incentives currently available to taxpayers in South Africa in respect of renewable energy research and development and the implementation of renewable energy technologies was then provided in chapter 3. This was followed by a critical analysis of the income tax incentives currently available to taxpayers in China in respect of renewable energy research and development and the implementation of renewable energy technologies in chapter 4.

Summary of findings on the renewable energy environments in South Africa and China

The need for renewable energy in South Africa has, in recent years become increasingly important and has created an opportunity to foster a more secure, labour intensive and sustainable economy and society (Pegels, 2010:4948). The energy sector in South Africa is heavily regulated and renewable energy initiative in South Africa is currently largely driven by the Independent Power Producer Procurement Programme (IPP).

It was found that far too few renewable energy projects for electricity generation have been deployed under the current renewable energy policies implemented in South Africa (Edkins, Marquard & Winkler, 2010:ii). According to Parker (2009), "tax incentives, if properly structured, can play a valuable role in moving South Africa toward a sustainable energy future".

In contrast, the Chinese government has been proactive and has implemented numerous renewable energy policies and regulations (Peidong *et al* , 2009:441). As a result of this, China currently has one of the most attractive markets for renewable energy investment in the world (Ernst and Young , 2012:21). It was found that China has numerous renewable energy technologies and there is much to be learnt from China in respect of their renewable energy policies and regulations.

Summary of findings in respect of the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa

It was found that South Africa has the following income tax incentives available for renewable energy research and development and the implementation of renewable energy technologies:

- Income tax incentives aimed at research and development.
- Capital allowances in respect of certain assets and buildings used in any process of 'research and development'.
- Allowances in respect of any machinery, plant, implements and utensils used by that taxpayer in the generation of electricity from wind, sunlight, gravitational water forces (limited to 30Mw) or biomass comprising organic wastes, landfill gas or plants' and any new and unused line or cable used for the transmission of electricity, including any earthworks or supporting structures forming part of the line or cable.
- An exemption from income tax for qualifying CDM projects.

Summary of findings in respect of the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in China

It was found that China has the following income tax incentives available for renewable energy research and development and the implementation of renewable energy technologies:

- Income tax incentives aimed at research and development.
- A HNTE tax incentive
- Exemptions and reduced tax rates in respect of CDM projects

- Exemptions and reduced tax rates in respect of environmental protection and energy or water conservation projects.
- A tax credit in respect of special equipment for environmental protection, energy and water conservation and production safety is available for set-off against corporate income tax payable.
- Incentives in respect of specific resources associated with the synergistic utilisation of raw materials in the production of goods.
- Exemptions and reduced tax rates in respect of ESCO projects.
- Credit in respect of special equipment for energy conservation.

6.2.3. To compare income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa and China in order to expose any differences and make relevant recommendations as to what South Africa can learn from China.

A detailed comparison between the current income tax incentives available in South Africa and the income tax incentives provided in China in respect of research and development, and the implementation of renewable energy technology was made in chapter 5. Based on the comparison performed, the differences between the tax incentives available in South Africa and those provided in China were exposed and relevant recommendations were made based on the findings in chapter 6. In addition, a hypothetical case study was performed in chapter 5 to illustrate the effect of the application of theory considered in chapters 3 and 4.

Based on the comparison and hypothetical case study performed, the differences between the income tax incentives available in South Africa and those provided in China were exposed and relevant recommendations were made based on the findings in chapter 6.

Summary of findings in respect of the comparison of the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa and China

It was determined that the number and variety of incentives for renewable energy research and development and the implementation of renewable energy technologies in China exceed the incentives that are currently available in South African. In addition, the hypothetical case study prepared in chapter 5 emphasised that in a scenario based purely on the application of the income tax incentives available to taxpayers in China for renewable energy research and development and the implementation of renewable energy technologies (not taking into account any political, economic and policy aspects or additional tax regimes), that China provides significantly a more beneficial tax saving than South Africa.

It was highlighted that there is much that can be learnt from China with regard to the implementation of income tax incentives to encourage renewable energy research and development, and the implementation of renewable energy technologies.

6.3. OVERALL CONCLUSION

It was found that there are a number of benefits associated with the implementation of renewable energy technologies. In addition to the benefits associated with the reduction of carbon dioxide emissions, renewable energy technologies offer environmental and health benefits, energy access particularly in rural areas, increased energy security and improved social and economic development through the creation of employment opportunities and economic growth.

Furthermore, it is evident that Governmental policies have the potential to advance technologies and stimulate markets; therefore it is important for governments to consider the implementation of policies which will encourage renewable energy research and development and the implementation of renewable energy technologies.

Based on the comparison provided in chapter 5, it was determined that the number and variety of incentives for renewable energy research and development and the implementation of renewable energy technologies in China exceed the incentives that are currently available in South African and it was highlighted that there is much that can be learnt from China with regard to the implementation of income tax incentives to encourage renewable energy research and development, and the implementation of renewable energy technologies.

All the objectives of this study were addressed and the outcome successfully determined. The aim to determine how the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies currently available in South Africa compare with the incentives available in China was achieved. The value that this study provided to the current body of knowledge lies in the comparison and recommendations provided in chapter 5.

Relevant recommendations based on the finding above will follow.

6.4. RECOMMENDATIONS

Based on the comparison, as well as the results of the hypothetical case study provided in chapter 5, it is evident that the types of incentives for renewable energy research and development and the implementation of renewable energy technologies in China exceed the incentives that are currently available in South African. For the purposes of this study, the following recommendations are made in order to assist the South African government to implement tax policies to encourage renewable energy research and development and the implementation of renewable energy technologies.

In the first place, well-conceived research and development policies can bring about an increase in the number of innovators that succeed in bringing innovative technology to the point of commercialisation. This can improve the investment climate so that innovators are more likely to obtain risk capital investments, in the early and later stages of research and development and implementation, from investors who are averse to high risks and lengthy delays before they can expect a return on their investments. (IPCC, 2011:886.)

Research and development tax incentives have been noted as a popular governmental policy mechanism, which has been implemented on a worldwide basis. According to Mohnen & Lokshin (2009:1), the main benefit of such research and development incentives is that their implementation assists in reducing corporate income taxes in proportion to the R&D effort. This has the effect that the cost of engaging in research and development activities is decreased, which in turn encourages firms to increase research and development to a level that is socially optimal. (Mohnen & Lokshin, 2009:1.) South Africa should therefore consider the implementation of a ‘patent box’ regime similar to China’s HNTE regime to stimulate the back-end of the innovation cycle in order to overcome the barriers to the funding of research and development of renewable energy technology.

Secondly, it is important for governments to ensure that they are able to create demand for renewable energy technologies in the marketplace, which would stimulate the implementation of renewable energy technology. There are a number of renewable energy specific policy options that are aimed at implementation (also referred to as ‘deployment’) and that have the potential to create a demand for renewable energy technologies in the market place.

Financial measures such as inducements based on investment, tax incentives, rebates and grants can reduce the costs and risk associated with investment in renewable energy by reducing the upfront cost of investments required for the installation and the cost of producing the technologies. These incentives compensate for market failures which render renewable energy at a competitive disadvantage and assist in reducing the financial burden of investing in renewable energy (IPCC, 2011:889). Based on Doshi’s (2012) view it can be assumed that ‘tax incentives do help spur spending and investment’. South Africa should therefore consider the implementation of tax incentives similar to China’s incentives in respect of environmental protection and energy or water conservation projects, energy service companies and the investment in energy efficient equipment to spur on the implementation of renewable energy technology.

Lastly, the IPP bidding process in South Africa requires that renewable energy components are locally sourced. This raises questions about the affordability of the projects. South Africa should therefore consider the implementation of tax incentives for the manufacturing sector, similar to China's incentives associated with the synergistic utilisation of resources as raw materials in the production of goods.

6.5. FUTURE RESEARCH

This focus of this study was to determine how the income tax incentives for renewable energy research and development and the implementation of renewable energy technologies available in South Africa compare with the income tax incentives available in China.

This study highlighted that there is much to be learnt from China with regard to the implementation of income tax incentives to encourage renewable energy research and development and the implementation of renewable energy technologies. This study did not consider the political, economic or policy environments in China and South Africa nor did it address the interaction of the tax incentives with any additional tax regimes imposed by the relevant legislative authorities. Furthermore, the study did not address the viability of the different Chinese tax incentives and governmental policies identified in a South African context.

There is thus an opportunity for future research to consider the political, economic and policy environments in China and South Africa in order to assess whether the Chinese tax incentives and governmental policies identified are viable in South Africa. There is further opportunity to identify and illustrate the interaction of renewable energy tax incentives with any additional tax regimes imposed by the relevant legislative authorities and the impact of the implementation thereof on the economy.

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